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ABSTRACT

This report examines the expanding role of community colleges, the emerging credentialing system, and the changes in the economy that have increased the value of credentials. While business has come to rely on higher education degrees to signify general skills, employers increasingly look for performance-based certifications as indications of more specialized skill. Part 1 of the report elaborates on the seven core credentialing roles of community colleges and the synergy among them. Part 2 describes the fragmented system of credentialing and certification as it expands beyond community colleges into a labyrinth of for-profit and not-for-profit postsecondary institutions, industry and trade associations, commercial vendors, and governments. Part 3 examines the economic and technological forces that are driving the current upheaval in credentialing and certification. These forces have changed the relationship between employers and employees, heightening the need for lifelong learning and demand for performance-based education and training. Part 4 examines credentialing as a dynamic two-way interchange between educational institutions and workplaces. Part 5 discusses the evolution and changing context of the community college, and part 6 presents issues facing the institutions. Part 7 concludes the report by acknowledging that the primary challenge for community college managers is to promote synergy across a wide variety of education and training programs. Contains 135 references. (JA)

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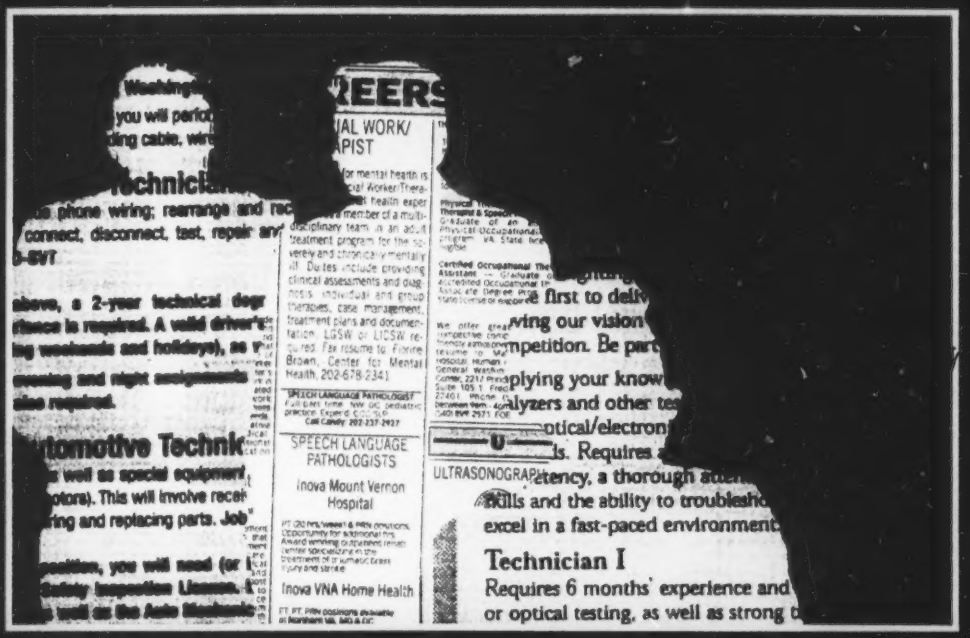

Community Colleges in the Knowledge Economy

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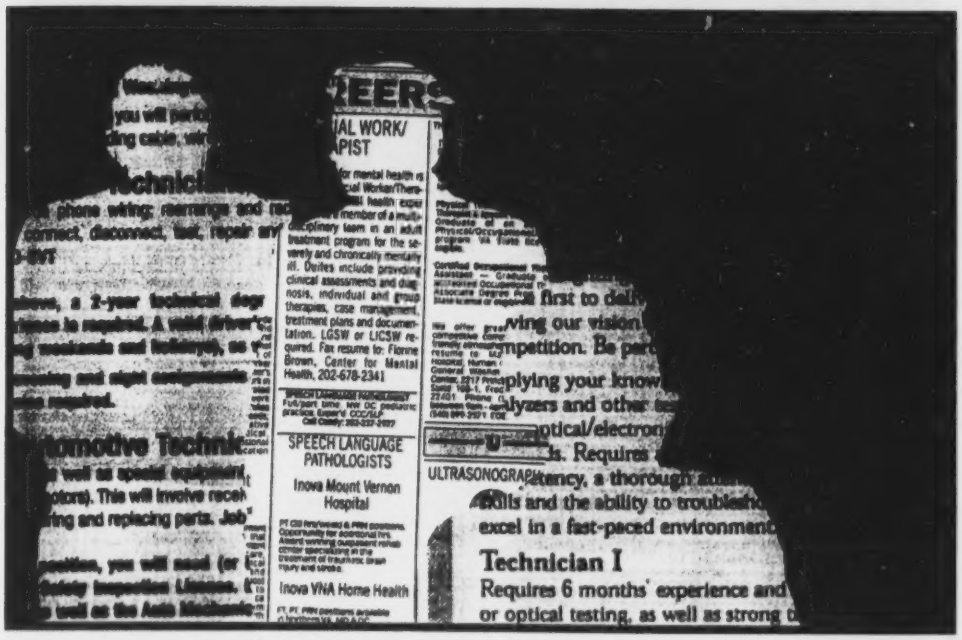

Community Colleges in the Knowledge Economy

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Anthony P. Carnevale and Donna M. Desrochers

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The American Association of Community Colleges (AACC) is the primary advocacy organization for the nation's community colleges. The association represents 1,100 two-year, associate degree-granting institutions and some 10 million students. AACC provides leadership and service in five key areas: policy initiatives, advocacy, research, education services, and coordination/networking.

The views expressed in this report are those of the authors and do not necessarily reflect the views of the officers and trustees of ETS or of AACC.

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Foreword

For American business to maintain its competitive edge, it is essential that U.S. workers keep pace with changing skill requirements as the "knowledge economy" continues to grow. New and rapidly changing technologies force workers to upgrade their professional and technical capabilities. And at the same time, businesses that realize their products must reflect creativity, customization, and exceptional customer service also are looking for workers with more general skills. While business has come to rely on higher education degrees to signify these general skills, employers increasingly value performance-based certifications and community college certificates as indications of more specialized skill.

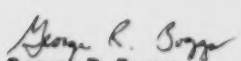
In this report, two senior Educational Testing Service (ETS) researchers, Vice President for Public Leadership Anthony P. Carnevale and Senior Economist Donna M. Desrochers, examine the expanding role of community colleges, the emerging credentialing system, and explore changes in the economy that have made these credentials even more valued.

The American Association of Community Colleges (AACC) leads the dialogue on the expanding role of community colleges. Since its inception in 1920, AACC has been a national voice for two-year associate degree-granting institutions. AACC works with other higher education associations, the business community, the federal government, Congress, and other national associations that represent the public and private sectors to promote the goals of community colleges and higher education.

Because of ETS' long-standing involvement in both education and occupational assessment, ETS has undertaken this study in collaboration with AACC. ETS has assessed the abilities of students and adults in the service of learning and expanding opportunity for more than 50 years. As the world's largest private nonprofit educational measurement organization, ETS is committed to providing opportunities for adults and young people and to using assessment to serve the public good.

While business has come to rely on higher education degrees to signify general skills, employers increasingly value performance-based certifications and community college certificates as indications of more specialized skill.

In pursuit of the missions of both AACC and ETS, we are pleased to add this contribution to our understanding of the importance of credentials in the changing economy, and the unique position that community colleges hold in credentialing skill. We commend this report to your reading and look forward to participating in the continuing dialogue on the issues it raises.



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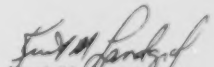

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Preface

In their characteristic efforts to adapt to new education and training requirements, community colleges have engaged in a continuing dialogue with other educators, community leaders, and employers as well as occupational and professional societies. Several years ago, two American Association of Community Colleges (AACC) advisory commissions—the Commission on Economic and Workforce Development and the Commission on Academic, Student, and Community Development—acknowledged a surge in demand for skills that help workers keep pace with a changing economy. Since that time, these Commissions have had ongoing discussions, drawing attention to changing skill requirements and weighing options for documenting learning that meets the needs of students, colleges, and employers. Reinforcing the importance of this issue, AACC designated *credentialing* as an area of special focus in its 2000-2001 agenda.

To expand the dialogue, the National Council of Occupational Education (NCOE) and the National Council for Continuing Education and Training (NCCET)—affiliates of the AACC—convened a conference in July 2000 to discuss emerging demand for nondegreed and noncredit education and training. Business representatives, community college leaders, and other interested stakeholders explored ways community colleges could expand their role in workforce development, customized training, and vendor certification. The proceedings from that conference, "Toward New Models for Certification and Credentialing in Community Colleges" (Carter, 2000), have succeeded in moving the dialogue forward.

This report examines the causes and consequences of proliferating credentialing standards at community colleges.

This report builds on that dialogue and adds new perspectives to the ongoing discussion. Like the current dialogue, the authors of this report focus explicitly on the need for market-sensitive credentialing. They examine the causes and consequences of the current proliferation of standards for credentialing skills in community colleges.

They demonstrate that the demand for increasing amounts of education and training, as well as greater diversity in credential offerings, stems from the nature and pace of economic and technological change over the past few

decades. The most powerful effects of the increased demand for human capital are on pre-K-16 education. New economic requirements have increased the demand for academic education dramatically. Since 1973, the share of Americans who make it all the way to college has more than doubled. And increases in general education are the driving force that results in complementary increases in certificates, certifications, and customized job training.

Since 1973, the share of Americans who make it to college has more than doubled. And this is driving complementary increases in certificates, certifications, and customized job training.

The authors also raise broader questions about the community college mission that are implicit, but unresolved, in the current dialogue. These questions include the proper balance between degrees, certificates, performance-based certifications, vendor certifications, and noncredit customized training.

As the new century gets underway, community colleges are charged with continuing to expand both academic and vocational offerings. The expansion of academic education is generally supported, but adding short-term education and training programs has proven more contentious. There is little doubt that more short-term training is needed. In our fast-changing economy, many workers, and some students, are seeking short bites of education and training to keep up with changing skill requirements. Community colleges feel increasing pressure to provide short-term education and training, but it is a role at odds with many educators' views of the community college mission.

The nation's community colleges, however, maintain a unique position in providing and validating these general and specific skills by offering a comprehensive set of academic and vocational credentials. In addition, they provide accessible internal pathways between education and training functions. The nation's comprehensive community colleges also provide direct links both to additional higher education through their transfer programs, and to business through their training functions.

Because of the multiple entry and exit ramps to its various education and training functions, community colleges have a primary advantage in educating and training the nation's students and workforce. This advantage, however, depends on the ability of community colleges to effectively harness

If they are to maintain their currency in today's economy, community colleges must update and expand the types of services, certificates, and training they offer their constituents.

the synergy among its multiple academic and vocational missions that allows it to simultaneously serve the community, meet business needs, and provide multiple options for student learning.

The current economic and technological upheaval and the new forms of credentialing it inspires bring the nation's community colleges to a crossroad. If they are to maintain their currency in today's economy, community colleges must update and expand the types of services, certificates, and training they offer their constituents. Otherwise, they may face a narrower future, as some employers and job-seekers turn elsewhere for the support and training they require. Community colleges can meet this challenge, but they must work harder than ever to balance their longstanding dual commitment to social equity goals on the one hand, and the needs of communities, employers, and individuals to adapt to changing economic and technological realities on the other.

Introduction

On the surface, the dialogue on new forms of credentialed learning and how community colleges should approach them seems to encapsulate the challenges that community colleges face today. But in actuality, the debate over credentials is really just the tip of the iceberg—the most obvious part of a growing tension over what the overall mission of community colleges should be in this new century (O'Banion, 1997; Rosenfeld, 2000).

Community colleges draw support from a broad array of stakeholders. Their continuing success results from collaboration between educators, business and community leaders, occupational and professional societies, and unions in selected industries. Recently, these varied and largely informal relationships have been rejuvenated by the upheaval in the credentialing of education and training caused by economic and technological changes at the core of the new knowledge economy. These relationships are critical to the ongoing restructuring of the human capital development system. They tend to emerge as self-forming networks based on reciprocity and mutual interests.

The debate over community colleges' credentialing role is really just the tip of the iceberg—the most obvious part of a growing tension over what the overall mission of these institutions should be in this new century.

These informal relationships among the stakeholders in the community colleges' future are governed mostly by healthy mission-related tensions. Different institutions bring varied but overlapping values to the bargaining table. All agree on the value of the synergy between education and training that is at the core of the comprehensive offerings of the community college. Differences are largely a matter of emphasis. For instance, employers want more job-specific skills, but they also recognize the importance of more general problem-solving, communication, and interpersonal skills in the new economy. Professional and occupational communities, as well as unions, are intent on preserving their discretion and values in the workplace. However, as competition in the global economy intensifies, they also recognize the need for greater efficiency and flexibility in producing and using skills.

Educators, meanwhile, recognize the value of job-specific skills because they know that people without them are inevitably excluded from mainstream American society. At the same time, they are committed to promoting upward

mobility, learning for its own sake, and learning that meets cultural and political needs—not just learning that provides utilitarian economic value. Moreover, educators are advocates for broad occupational preparation that will allow individuals to adapt to relentless economic and technological change. Educators support community colleges because they provide for academic transitions. These schools also provide postsecondary education for less than it would cost to expand the nation's four-year colleges. Finally, the existence of community colleges allows four-year institutions to preserve their selectivity (Dougherty, 1994).

An increase in the need for more education and training in the new knowledge economy, combined with changing demographics, requires the nation's community colleges to strike a new balance in what they offer.

Collectively, public policymakers tend to bring the broadest set of goals to the table. They support community colleges because they promote opportunity and economic development. They always have been the primary source of financial support and the arbiters of academic and economic purposes in community colleges.

The dramatic growth in community colleges themselves proves the stakeholders' effectiveness. Apparently, the structures represented by stakeholders balance academic and utilitarian functions that draw broad support. If business needs were the dominant power and primary concern, employer-provided training, apprenticeships, specialized vocational programs, and proprietary schools would have grown more. If academic interests were the overwhelming priority, an expansion of four-year colleges would have been the more likely result.

The radical increase in the need for both more education and training in the new knowledge economy, combined with changing demographics, requires the stakeholders in the nation's community colleges to strike a new balance. The current bargain among public and private interests will have to change at its core:

- **Four-year colleges** will need to develop stronger collaborations with community colleges and, if community colleges are to improve academic transfer rates, they will need more resources.

- **Business organizations** that increasingly use community colleges for certificates, performance-based certifications, and customized training will need to be more supportive—in both political and financial terms—of the

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community colleges' dual mission to provide academic *and* general occupational skills.

- **Policymakers** will need to create public and private incentives that promote the rebalancing of the community colleges' education and training mission to encourage higher quality, variety, customization, and innovation in both.

The dialogue over the future role of community colleges will be influenced by an external economic and demographic environment that will demand more education and training for less money.

The dialogue over the future role of community colleges undoubtedly will be influenced by an external economic and demographic environment that will demand more education and training for less money. As the decade continues, the continuing shift toward the information or knowledge economy will mean ever-rising demands for human capital investment. Meanwhile, the numbers of college-age youth, especially minorities, will rise substantially. Pressures for greater efficiency in the use of resources and competition for resources will be fierce, if the nation is to meet growing needs all along the education pipeline—from pre-K-16 education, to graduate education, to lifelong learning.

Moreover, because community colleges are last in line for public and private subsidies, market forces may shift them toward commercial training. And yet, as demands grow for postsecondary education and the college-age cohort grows and becomes more diverse, the characteristic synergy between academic and vocational programs in community colleges will be even more useful in serving both education and training needs (Carnevale and Fry, 2001).

Organization of this Report

In Part 1 of this report, we elaborate on the seven core credentialing roles in community colleges and the synergy among them. In Part 2, we describe the fragmented system of credentialing and certification as it expands beyond community colleges into a labyrinth of for-profit and not-for-profit postsecondary institutions, industry and trade associations, commercial vendors, and governments. We find that certification and certificate programs outside the more traditional educational venues come in all shapes and sizes and are constantly reinventing themselves. Nonetheless, we attempt to separate them

into rough categories in the interest of definition and discussion, and to look at this diverse system of certification and certificates according to their providers, purposes, and market size.

In Part 3 of the report, we examine the economic and technological forces that are driving the current upheaval in credentialing and certification. These forces have changed the relationship between employers and employees, heightening the need for lifelong learning and demand for performance-based education and training. Perhaps the most profound effect of economic and technological change has been the escalation of degreed and nondegreed learning requirements in labor markets. While technology has been a critical ingredient in creating the knowledge economy, the largest share of new knowledge jobs has not gone to those with purely technical skills, but rather to people with postsecondary credentials working in offices and educational and health care institutions. Part 3 concludes with a discussion of the growing importance of education in promoting opportunity and the growing inequality in earnings that results from widening differences in access to postsecondary skills and credentials.

The demand for increased credentialing options—at decreased cost—stems from the growing importance of education in the labor market, which drives the growing inequality in earnings resulting from widening differences in access to postsecondary skills and credentials.

Part 4 examines credentialing as the dynamic two-way interchange between educational institutions and workplaces. The United States, like other advanced industrial nations, needs to adapt its skill credentialing systems to economic change. However, differences in the labor markets and the education and training systems among the world's industrial nations will ensure that adaptation proceeds along different paths. Part 4 also discusses the new workplace's need for broader and deeper general skills as opposed to more job- and technology-specific skills. Technology and new work processes require more of the cognitive skills traditionally represented by general academic credentials as well as new soft skills, including problem-solving and interpersonal skills. We also examine how the more general skills provided by degreed education and the specific skills associated with training complement and can be substituted for each other. We find that while they can function as substitutes, they are most powerful when they are used together.

Part 5 chronicles the parallel growth in general and specific skill requirements and expanding education and training functions that led to the

"comprehensive" community college. This all-things-to-all-people mission causes tension between the academic and vocational functions of community colleges, even though their synergy clearly expands opportunities for individuals while making community colleges more effective in meeting their communities' economic needs. Part 5 also discusses how resource constraints and the impending surge of college-age youth may require community colleges to make some difficult choices in the future. In concept, the surge in new students could allow community colleges to strengthen their academic and transfer functions. At the same time, funding pressures may force reductions in academic programs and encourage dependence on commercial opportunities, during a time when competition in training markets is likely to become more performance-based and more intense. Maintaining the virtuous synergies between the academic and vocational missions in community colleges will require new financing arrangements, new managerial strategies, and a new bargain among community college stakeholders. Furthermore, there is a growing disconnect between traditional accreditation and time-based credentialing in community colleges and the growing need for performance-based education and training.

For community colleges, the increasing curriculum demands result in heightened tensions between broader academic content and more focused training needs.

Part 6 looks at issues facing community college leaders now and in the future. Given the proliferation of education and training programs offered by community colleges, internal and external institutional alignment is increasingly complex and important. The increasing scope of community college curricula also results in a heightening of tensions between broader academic content and more focused training needs. Quicker responses to market-driven training needs require increasing agility in curriculum development, which can be uncomfortable in academic institutions. Concern that degreed programs will be cannibalized by narrower stand-alone certificate or customized training programs also is a product of these mission-related tensions.

In conclusion, Part 7 acknowledges that the primary challenge for community college managers is to promote synergy across a wide variety of education and training programs—a remedy as obvious as it is difficult. As education and training functions proliferate, community college leaders struggle constantly for coherence. But leaders need to proceed cautiously, because various education and training functions emphasize different cultural values, represent

The greatest danger to comprehensive community colleges is that financial pressures may force them to make choices that are counterproductive to one or more of their multiple missions.

different customer requirements, and present a unique pedagogy. The trick in promoting synergy is to first recognize differences and then to exploit commonalities.

The greatest danger to comprehensive community colleges is that financial pressures may force them to make choices that are counterproductive to one or more of their multiple missions, reducing the positive effects that result from their synergy. Policymakers, business and community leaders, and educators must coalesce to preserve the unique capabilities that comprehensive community colleges offer. This is crucial to the future success of an economy where the distinctions between academic and vocational learning continue to blur, and in a society increasingly divided into postsecondary education haves and have-nots.

PART 1: The Multiple Credentialing Roles of Community Colleges

Open Sunday's *Washington Post, Boston Globe, San Jose Mercury News,* or *Austin Chronicle,* and the employment section reads like alphabet soup. In addition to a college degree, employers are in search of CNAs, CNEs, CCDAs, MCSEs, and MCPs. Those with a professional certification and some experience now go to the top of the resumé e-mail box because workers with information technology (IT) certifications are hot commodities in today's job market. Not only have the number of IT certification programs and students seeking them increased, but so have the venues for developing these skills. The DeVrys, ITTs, and Chubbs of the world have put for-profit IT certification and credentialing programs on the map.

Information technology certification is just one of many credentialing concerns facing America's community colleges. Along with the learning needs of the knowledge economy, the growing complexity, proximity, and diversity of the local, national, and global community have increased learning requirements and the need to validate knowledge. Demands for learning that are validated by degrees, certificates, certification, licensure, or the "smile tests" of consumer satisfaction are all on the rise (Levy and Murnane, 1992; Marshall and Tucker, 1992; Levy, 1998; Adelman, 2000; Bureau of Labor Statistics, 1985, 1992). Each provides a different kind of added value to learning; each connects to different values at the core of the community college mission.

Demands for learning that are validated by degrees, certificates, certification, licensure, or the "smile tests" of consumer satisfaction are all on the rise.

With demand for all types of learning on the rise, community colleges are struggling to find the appropriate balance between their education and training missions. These mission-related tensions are not new. They have intensified, however, as access to postsecondary education has become the threshold requirement for economic opportunity. At the root of the tensions are concerns about equity, which are forcing community colleges to weigh their commitment to academic preparation for higher education against their vocational and economic functions (Brint and Karabel, 1989; Dougherty, 1994). While both the academic and vocational offerings of community colleges provide opportu-

nity, it is their combination that results in the unique democratizing effects of community colleges. The challenge is for each community college to find an optimal balance among the core elements of its mission and the most appropriate way to validate the learning attached to those core components (Bailey, 2000; Alfred and Carter, 2000).

Community colleges should be evaluated by standards that apply to all institutions: cost, quality, equity, social responsibility, variety, customization, convenience, innovation, and speed. But the variety of community college missions means there is no one-size-fits-all method for evaluating each of the community colleges' roles.

Ultimately, community colleges should be evaluated by the same performance standards that apply to every modern institution: cost, quality, equity, social responsibility, variety, customization, convenience, innovation, and speed (Carnevale, 1991). But the variety of missions in community colleges means that there is no single best mix of outcome standards or any one-size-fits-all method for validating each of the community colleges' roles. Each of these roles provides different kinds of legitimate value. Each is organized and financed differently, and each requires different teaching competencies and validation (Grubb, 1999a).

The Multiple Missions of Community Colleges

Community colleges are unique American learning institutions that effectively link general education to the dynamic of skill change in the workplace. Every community college is a complex network of organizational capabilities that serve overlapping but different roles and require different forms of validation. The common thread among these roles is the emphasis on teaching and student learning as opposed to R&D or publishing in academic disciplines (Grubb, 1999a). Community college roles include:

- Academic preparation, either for transfer to four-year institutions or for terminal academic degrees.
- "Second-chance" remediation for native-born students to provide access to jobs with formal or informal training, or further academic or occupational education.
- English language development or other forms of learning focused on the needs of English language learners, including the foreign-born.
- Public job training for disadvantaged clientele.

- Occupational preparation for public or private credentialing, licensing, and certification.
- Worker-initiated short-term training and individual development.
- Customized training and certification for employers and equipment vendors.

Talking About Credentials

In common usage, credentials refer to a broad array of qualifications for work, including degrees, certificates, certifications, and even work experience. However, to educators and trainers, as well as occupational and professional authorities, credentials are represented by degrees, diplomas, or certificates that document formal learning. Most degrees, diplomas, and certificates only require completion of a prescribed course of instruction. Certification, however, requires passage of an exam benchmarked to predetermined occupational or professional standards.

Although the words—certificate and certification—are similar, there are important differences between postsecondary certificates and certifications. Postsecondary certificates, like degrees or diplomas, are based on completion of a prearranged course of instruction, while certifications require passage of a professional, industry, occupation, or vendor exam tied to fixed standards. Some, but not all, certifications also require prior education and experience—nurses, for example, must have both a nursing school credential and practical experience, and must pass an exam based on established standards to earn certification in a specialty field. While some degree, certificate, or diploma programs may prepare students for an independently administered certification exam, completing the program does not guarantee the student will pass the exam. Some certifications do not require prior schooling or experience. Many IT certifications are examples.

Dialogues on credentialing are often stymied by ambiguity in language. To clarify the discussion, throughout this report, we use terms in a manner consistent with the definitions as stated above.

It may be only a matter of time before demands for curriculum "content" standards and performance assessments to certify content mastery reach nonvocational postsecondary education.

Community colleges also provide a variety of other services, including counseling and career development, small business incubation and technical assistance, and community-based supportive services, such as child care and family counseling (Bailey, 2000; Jacobs, 2000).

Academic education at community colleges is largely validated through accreditation processes. Because the public stake in the equal opportunity to learn usually demands minimum standards for necessary resources to meet this goal, public accreditation is most prevalent for academic functions. Requirements for accreditation usually focus on resource inputs, including facilities, equipment, faculty credentials, curricula content, and hours of instruction in particular programs. The more recent trend in academic education has been to supplement the accreditation of institutions based on inputs with standards for learning outcomes. In the future, nonvocational postsecondary education may mimic elementary and secondary reform by relying less on time-based curricula and traditional accreditation and more on formal assessments based on outcome standards. It may be only a matter of time before demands for "content" standards for curriculum coverage reach nonvocational postsecondary education. Where there are content standards, "performance standards" that utilize assessments to certify levels of mastery in content areas are never far behind.[1]

While the support for prescribed content and performance standards has been strong in elementary and secondary education, there may be greater resistance and complexity in crafting universal standards and assessments in postsecondary education. Most educators agree there is a common core of measurable knowledge that should come with early preparation. There is less agreement, however, on a common core of knowledge in postsecondary learning, except in particular disciplines. Moreover, postsecondary nonvocational education has been viewed as a period of individual exploration and development that should be left unencumbered by content and performance standards, especially those imposed by state or federal authorities (Rorty, 1999; Gutmann, 1987).

Remedial education for English language development, second-chance education, and training programs are far more likely to be subjected to validation through standards and outcome assessments. For the most part, remedial programs develop readiness for postsecondary programs or work, and their intent is to

1 "Performance-based standards" has broad meanings in the education policy arena. In general, it refers to any outcome standard associated with education and training, as distinct from "time-based" completion of a prescribed course of instruction. Community colleges are charged with meeting a variety of performance-based standards ranging from assessments of learning acquired to job placement and job tenure. In the assessment community, "standards" and the notion of "performance-based" standards have more complex meanings. Standards, for instance, can either be based on predetermined performance goals (criterion-referenced) or based on performance relative to a relevant group (norm-referenced). In addition, the notion of performance-based assessment tends to refer to assessments, or individual tasks in an assessment system, that are more open-ended, hands-on, and applied—as distinct from standardized multiple choice items, for instance.

bring people up to K-12 rather than postsecondary levels. At present, most remediation programs are not subject to accreditation or performance-based standards.

Community colleges have led the way in developing new forms of validation for federally funded **public job training** and education. Community colleges provide education and training to clientele in publicly funded job training programs, while a variety of other services, including career counseling and job search assistance, are provided by government-sponsored One Stop Employment Centers often located on community college campuses (Carnevale and Jacobson, 1998).

Community colleges have led the way in developing new forms of validation for federally funded public job training and education.

Occupational preparation for licensure and certification presents a mixed bag of validation issues for community colleges. As the knowledge economy grows, more and more occupations require complex knowledge and esoteric skills. In addition, as complexity and skill requirements increase in occupations, workers in those occupations enjoy more discretion in their work, making fixed performance standards even more difficult. For example, nurses, computer technicians, and auto mechanics have acquired a complex and esoteric body of knowledge that they use selectively when treating particular patients, solving particular IT puzzles, or repairing particular vehicles.

In many cases, those in certain occupations, especially the crafts and professions, want control over validation procedures in their fields in order to maintain high standards and retain the discretion necessary to do their work. In addition, many crafts and professions are communities with distinctive values as well as skills. Professional and occupational communities tend to believe that occupational mastery includes values as well as demonstrated skill, and are unwilling to hand over the validation process to institutions with different values. A case in point: The ongoing fight between the efficiency-minded health maintenance organizations (HMOs) and the service-minded health care professionals to create standards for care (Krause, 1996).

The process of validating mastery in particular occupational areas is further complicated by the need to protect the public and to inform consumers or prospective employers. These parties depend on validation procedures to tell them whether the people in certain occupations possess the esoteric knowledge

they say they do, and can be trusted with the discretion to use it safely, wisely, or profitably. Employers, consumers, and the public also have an interest in ensuring that the esoteric knowledge is not used to limit access to the occupation or to create unfair economic advantage. The role of community colleges in occupational preparation for licensure and certification requires careful attention to the interests of the public, the occupation, consumers, and employers.

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Short-term training for work or avocational individual development serves the "community function" of the community college by allowing citizens to pick up some new skills or explore hobbies. Validation is measured by how well the courses meet students' needs. Sometimes, it also can be gauged by the willingness of those students to rematriculate for additional learning.

Customized training tends to be privately financed and validated through meeting customer specifications. Customized training often occurs at the cutting edge of new skill requirements and technological change in the world of work. It is validated through customer satisfaction and emphasizes cost, speed, flexibility, and customization as primary measures of institutional performance.

Synergy among Community College Roles

There are obvious positive synergies among the community colleges' many roles in education and training. The mix of education and training encourages powerful connections between academic and applied pedagogy and between theory and practice and provides a continuous two-way path between the academy and the community. The continuum from degreed learning to noncredit customized training also connects current learning requirements, anchored in established academic and vocational curricula, with emerging skills and knowledge being formed in the world of work, resulting in a dynamic link between current and future knowledge and skill requirements.

The multiple roles of the community college provide *bona fide* bridges between school, work, and community. The multiple roles open many doors for learning to traditional 18- to 24-year-old college students as well as to adults and other

nontraditional college students. Community colleges are unique houses of learning: One doorway can lead to many others. A student can enter through a noncredit customized course, find his or her way to a full array of credit courses leading to degreed education at the community college, and transfer to a four-year university. The same student could opt instead to pursue various forms of occupational and skill certification and licensing. In a market of isolated niche institutions, community colleges provide the value added of a one-stop shop and a learning network.

There are value-based tensions among the multiple roles of community colleges: They have to live with the ambiguity that comes with the strains between the provision of education and more applied forms of training. The inherent conflict between the need to prepare freethinking citizens on the one hand and the needs of employers on the other is at the heart of this ambiguity. "Education versus training" and "commercialism versus professionalism" are the most common ways to express these differences (Krause, 1996). The conflict is a healthy one—it forces community colleges to constantly rebalance their social and economic roles to maximize the synergy between them (Graubard, 2000; Bailey, 2000; Jacobs, 2000).

Managing Credentialing Functions

As community colleges struggle with the broader issues of validating learning and effectively balancing their education and training functions, they also face more imminent decisions about how to manage their credentialing functions.

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With the emergence of the knowledge economy and its rapidly changing technologies, community colleges are grappling with how to respond quickly and adequately to the changing needs of the workplace. For-profit providers are perceived to be more agile in responding to incremental technology and workplace changes by providing students with short-term training. Meanwhile, many community college faculties are struggling with the time-consuming process of integrating short-term training needs into broader vocational and academic curricula (Lerman, Riegg, and Salzman, 2000; Grubb, 1996). At the same time, as they develop their own curriculum and credential-

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ing system, professional societies and vendors, particularly in IT, are completely bypassing the traditional education and training infrastructure (Adelman, 2000).

By integrating their curricula among certificate, degree, and customized training programs, community colleges respond to the curriculum demands of students and employers, better align their programs with workplace needs, and shore up the validity of the credentials they confer. Coordinating these program offerings can strengthen important relationships between community colleges and the world of work. Not only are these relationships important for colleges because they help update and freshen curricula in response to changing skill requirements, they also provide an important source of new revenues as well as recruitment for new students and business clients in broader programs. Moreover, they provide broad-based community and business support for colleges in competition for scarce public resources.

At the same time, narrower certificate and customized training programs also can be a mixed blessing for community colleges. Short-term certificate and training programs absorb resources and can be added and dropped with little effect on broader disciplines. Although some new skill requirements taught in recently developed certificate or customized training programs may eventually integrate into broader degree programs, not every incremental skill change evolves into a basic educational or occupational requirement. In addition, if their only effect is the cannibalization of existing degree programs into shorter courses, certificate and short-term training programs may not add new students (Patterson, 1999a; Welch and Syverson, 1997).

The absence of program standards within and among community college credentialing programs also presents a challenge (Alfred and Carter, 2000; Bailey, 2000). The courses required to earn a nondegreed credential vary across institutions as well as by field within the same institution. The nonstandard inputs into these certificate programs—often warranted by various programs' content—encourage employers' skepticism about the validity of credentials without content standards or performance measures (Carter, 2000). This flexibility, however, allows each community college to tailor certificate programs to meet local industry needs. Nevertheless, community colleges need to determine

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what the program standards are and who sets them—the colleges, local employers, or national professional, occupational, and industry associations. Going a step further, community colleges need to define the role of employers, vendors, and associations in curriculum development.

Concerns over credentialing programs will continue to beset community colleges across America. But the issue is actually much broader, rooted in the larger matter of validating learning and harnessing the combined power of the multiple community college missions. Community colleges' daily efforts to manage internal credentialing functions and find their place among a host of external standard-setting institutions and providers are at the heart of the struggle to find a balance between the community colleges' education and training functions. In the continual sparring match between these missions, it is in the best interests of society that neither protagonist scores a knockout punch.

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PART 2: The Fragmented System of Credentialing and Certification

In the United States, the current credentialing and performance-based certification system expands well beyond the community college. It is a labyrinth of for-profit and not-for-profit postsecondary institutions, professional, industry, and trade associations, commercial vendors, and government. Certificates or performance-based certifications usually signify short-term or targeted preparation in a skill or discipline. While there are significant differences between certificates and certifications—the latter generally requires passing a criterion-referenced assessment—both acknowledge learning. Some nondegreed credentials and certifications recognize specific skills within an industry or occupation, others acknowledge mastery in a technical or professional field, and still others supplement baccalaureate or post-baccalaureate degrees (Irby, 1999).

Certificates or diplomas, which indicate specialized education or training in a specific field, are perhaps the most common form of nondegreed credential. One can usually earn these credentials in less than a year or two,[2] after completing a structured program. At the community college, these certificates can be either for-credit or non-credit,[3] and are most often awarded in business management and administration, engineering, protective services, health-related technologies, and automotive repair (Phillippe, 1997).

Recent years also have seen a proliferation of post-baccalaureate certificates (Patterson, 1999b; Irby, 1999).[4] These certificates often supplement degrees already attained, and signify that students have obtained new specialized knowledge in their particular field or have upgraded their job skills. Some of the more popular post-baccalaureate certificates are in health care, business fields including human resources and marketing, or in publication and design areas, such as desktop publishing or graphic arts. Sometimes, students without master's or doctorate degrees in particular subject areas use post-baccalaureate certificate or certification programs as an entrée into broader post-graduate degree programs (Welch and Syverson, 1997). Certificates also may enable students to meet the continuing education requirements of professional credentialing and certification providers (Welch and Syverson, 1997).

[2] National statistics classify less than one-year nondegreed credentials as those completed in 30 credit hours or less, or in fewer than 900 contact hours with an instructor. At least one-year but less than two-year nondegreed credentials are awarded to those completing a program of at least 30 credit hours but not more than 60 credit hours, or at least 900 but less than 1,800 contact hours. Nondegreed credentials that require at least two, but less than four, years are awarded for completing at least 60, but fewer than 120, credit hours, or between 1,800 and 3,600 contact hours (U.S. Department of Education, 1997).

[3] The credit hours accumulated in for-credit certificate programs can be used to meet degree requirements. For example, students earning a certificate in food and beverage management can apply those credits toward an associate degree in hospitality management. On the other hand, the courses that comprise a non-credit certificate, as in a travel agent program for instance, cannot be used toward a degree program.

[4] National educational statistics classify post-baccalaureate certificates as requiring 18 hours of classtime and post-master's as requiring 24 hours, with neither fulfilling the requirements of a degree program (U.S. Department of Education, 1997).

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Another type of credential—certifications—acknowledges proficiency in an array of professional or technical fields and is usually awarded by vendors or professional, industry, or trade associations after individuals pass a standards-based examination. For example, the recent incarnations of IT certifications signal mastery with a particular technology. The sufficient amount of knowledge or skill that indicates "mastery" of the technical area is determined by the vendor. Professional associations also confer certificates of competence in a wide variety of industries and occupations—Certified Employee Benefit Specialists, Certified Environmental Auditors, and Certified Professional Ergonomists are examples. In each of these professions, professional associations have implemented a standard of competence in their field and an assessment mechanism for measuring it.

In the United States, the credentialing and performance-based certification system is a labyrinth of for-profit and not-for-profit postsecondary institutions, professional, industry, and trade associations, commercial vendors, and government.

Credential Providers

Just as there are different types of certificates and certifications, there are different types of institutions that certify skills. Community colleges tend to offer a wide range of certificate programs. Baccalaureate institutions also are beginning to offer more certificate options for study. While these institutions may shape their curriculum to prepare students for a certification exam, there is a clear distinction between a certificate offered by a postsecondary institution and a certification. Postsecondary certificates are usually specific to a particular postsecondary institution and are awarded to those who satisfactorily complete a core of courses, signifying seat time in a curriculum module. Certifications are more often national, occasionally global, and always based on a standards-based assessment of student knowledge. However, these credentials are not necessarily unrelated. For example, many automotive repair programs offer certificates but also prepare students to sit for the Automotive Service Excellence exam, which certifies workers in automotive specialties such as brakes, exhaust, engines, and other areas (National Institute for Automotive Service Excellence, 2000).

Proprietary (for-profit) schools also provide a venue for credentials and certification. These schools are similar to community colleges in that they provide a

variety of different courses that result in a credential in a particular occupation. These schools are more likely to focus on providing training to prepare workers for a national certification rather than an institution-based certificate (Parsad and Farris, 2000). However, proprietary schools do not usually offer the broader education that is a part of a well-rounded degree program at a community college. In addition, because additional education and training generally is not available on site, proprietary schools typically leave students with fewer opportunities to continue their studies.

Community colleges have a distinct role among education and training institutions, offering credentials in particular occupations in combination with a broader education that is part of a well-rounded degree program.

One rapidly growing type of certification is "vendor certification," (Adelman, 2000) which proves that students are knowledgeable about a particular technology or product, rather than a more general field. For example, Microsoft Certified Network Engineers are certified to maintain a Microsoft computer network, not a general network system. Furthermore, with vendor certifications, the curriculum is designed by the vendors themselves, not a professional association, college, or proprietary school. Accordingly, vendors generate the exam, which students can prepare for through self-study with vendor manuals or courses offered through community colleges, proprietary schools, universities, or even some high schools. Vendors also hold the sole discretion for eliminating certain certification programs and instituting new ones.

While vendor certifications are prominent in the preparation for an IT career, some vendor-neutral certifications have been developed to capture and expand upon the narrow, product-specific focus of many IT certifications (McGrath, 1998). For instance, these programs would certify a worker as a certified systems engineer, rather than a Cisco or Microsoft Certified Systems Engineer. In addition, some technology companies have developed internal certification programs that certify workers' competence with their employers' hardware, software, and systems (McGrath, 1998).

National and, to the extent they exist, international credentials generally are promoted and maintained by industry, trade, or professional associations. In some professions, knowledge by examination is enough proof of competence, while others may also require coursework and/or work experience. In fact, education and/or a certification examination is the required criteria for nearly 60 percent of association-sponsored certifications. More than one-third of

association-sponsored certifications require re-certification at least every three years, while continuing education is required to maintain certification in 63 percent of associations. About 15 percent of associations also have an arm that accredits education or training programs that have curricula that meet their standards (American Society of Association Executives, 1996).

In many professions, certification provides professional recognition of competence. In others, it serves as a prerequisite for obtaining a license to practice.

National organizations usually contract with testing organizations to perform job analyses to determine what knowledge workers need to be proficient in a particular job. The testing organization then designs an examination to test workers on the relevant knowledge. In many professions, certification provides professional recognition of competence, as is the case with Chartered Financial Analysts, Certified Crane Operators, or Certified Environmental Trainers. In other professions, such as nursing and architecture, national certifications serve as a prerequisite for obtaining a license to practice, but each state licensing board maintains the final control over who is granted a license.[5]

Finally, states themselves provide credentials. In most instances, the state does not provide any education or training. In some occupations, the state board may administer an exam. In others, an exam administered is by a national professional organization, such as The American Institute of Certified Public Accountants, or an independent examination body.[6] Generally, state regulatory boards set education and training requirements, and then review applicant credentials to determine whether a license or certificate should be granted. In some instances, obtaining a credential from a postsecondary institution or national certification program makes it easier for professionals to receive licensure from the regulatory board in their state.

The Impetus for Credentials

Many who seek credentials and certifications today hope to get a better job and increase their earnings. But skills certification also serves a broader social purpose. Skills certification, in the form of licensure and statutory certification, is a governmental regulatory mechanism that gives consumers confidence that workers in an occupation meet an acceptable standard of knowledge (Schmitt and

[5] Although many state boards have similar licensing requirements, they can vary across state lines.

[6] Many professional associations have been forced to relinquish direct control of their examinations to an independent body. For example, architects, engineers, nurses, and physical therapists each have a National Council of State Boards that administers their examinations. Since licensure is intended to protect the public, separating the examination function from the direct control of the association avoids a potential conflict of interest that may arise when the association acts as an advocate for the profession.

Skills certification helps individuals advance, but it also serves a broader social purpose, giving consumers confidence that workers in an occupation meet an acceptable standard of knowledge.

Shimberg, 1996). There are nearly 1,000 government-regulated occupations[7] in the United States: Nearly 500 require workers to obtain a license to practice in a particular occupation; about 65 award a certification that represents the mastery of a certain base of knowledge or skill; and more than 600 require the least restrictive type of regulation—registration—that requires workers to register with a regulatory body[8] (Young, 1987).

The altruistic motivation behind credentialing also can have an elitist effect, however, because people without proper credentials lack access to privately or publicly regulated occupations. Credentialed members of regulated occupations enjoy greater earnings potential and opportunities for career advancement, because credentialing requirements create barriers to entry in occupations, sheltering credentialed individuals from market competition.

States generally require a license or statutory certification to protect consumers and provide consumer information. The mark of a licensed occupation is unambiguous: Workers are required to obtain a license prior to practicing, and anyone without a license practices illegally. Statutory certification, on the other hand, grants only title protection indicating a state has passed a law that reserves a designated title for those who meet the state certification requirements. For example, in states that certify interior designers, only those individuals who have met the state standards may use the title "Certified Interior Designer." Statutory certification and licensure are similar in that workers are required to meet a set of prescribed educational requirements and/or pass an exam to satisfy the state regulatory board. The main difference in these state-regulated occupations is that workers can practice their profession without a statutory certification, unlike workers in licensed occupations[9] (Schmitt and Shimberg, 1996).

Licenses are generally required to demonstrate minimal competencies necessary to *protect consumers*. Occupations requiring licenses are usually those involving the greatest risk of harming consumers. Examples include health care workers as well as many workers in the construction trades, such as master electricians whose faulty wiring can cause a fire, or aircraft mechanics who supervise airplane repairs (Shimberg, Esser, and Krueger, 1973).[10] Other occupations that require licensure, such as barbers and hairdressers, funeral directors, and private detectives, may be able to inflict less harm on the public.

[7]Some occupations may fall into more than one regulatory category because in some states, a license is required in a particular occupation, while in another state, only registration or certification may be required for the same occupation.

[8]Registration does not necessarily require the worker to demonstrate any special skill, but it does provide the means for tracking a worker in the event of a consumer complaint. Cemetery salespersons, time-share salespersons, and security guards are examples of occupations that require registration in some states (Schmitt and Shimberg, 1996).

[9]In practice, the nomenclature and structure of state licensure and certification is cloudy at best. Some states do not distinguish between professions that require "licenses" or "statutory certifications." Instead, the states grant only licenses, but distinguish between professions that are

(continued on next page)

Nonetheless, each has a function that has been determined to merit regulatory protection for consumers.

By contrast, **statutory certifications** granted to a particular occupation are not primarily intended to protect the consumer from direct harm. Instead, they are meant to *provide the public with information* about the skills and abilities of a worker (Schmitt and Shimberg, 1996). Consumers who buy services from professional and service workers can use certification to gauge the quality of the provider. Sending your children to a certified child care professional, hiring a certified home inspector, or scheduling a massage with a certified masseuse helps ensure a level of quality that, it is hoped, will translate into customer satisfaction.

Some credentialing tools are designed to protect the public from harm, others to provide the public with evaluative information, and still others to inform employers.

Some professions have decided not to pursue state licensure or statutory certification requirements at all (presumably to avoid having to secure costly state-by-state regulatory legislation) and instead established a national certification program. Other professions, however, have continued to pursue state regulation even after developing a national certification program (Schmitt and Shimberg, 1996). Nevertheless, state licenses and certifications differ from professional and industry certifications because these nongovernmental certifications are voluntary, except when the state requires them prior to granting a license or statutory certification.

Voluntary certifications offered by professional associations typically indicate a level of proficiency, rather than minimal competence. This separate, and growing, class of certifications is primarily intended to *inform employers*. Since few consumers request their services, professional society credentials, such as Chartered Financial Analysts and Certified Food Safety Professionals, or vendor certifications found in the IT industry, have little direct impact on consumers. Employers are the primary beneficiaries of the information conveyed by these credentials. Initially, employers use these credentials in hiring because a certificate of specialization indicates that employees have the necessary knowledge to do the job. These certifications often exempt the employer from providing a significant amount of specialized entry-level job training and ensures that employees have a knowledge base that allows them to adapt to changing conditions on the job, further reducing informal and formal training costs.

"licensed by discipline" or "licensed by title." Licensing by discipline conforms to the standard definition of licensure, which prevents anyone from practicing the profession unless they have a license. Licensing by title is similar to statutory certification—it only grants title protection.

Adding to the complexity, some states may license a particular profession, while another set of states may certify it even though in practice the regulations are the same, as are the examination and additional experience and education requirements to receive the license or state certification.

[38]Some licensing requirements have industry exemptions. For example, engineers and architects do not have to be licensed if they work for a corporation and do not have to stamp official plans. Similarly, workers who perform airplane repairs do not have to be certified, although the supervisor who monitors and signs off on the repair work must be licensed.

The Credentials Market

With the host of different types of credentials, certificates, and certifications, and the multitude of providers, it is difficult to ascertain the exact size of the market. The fact that much of the market lies outside the traditional education system makes the task even more formidable. Available evidence, however, confirms that the market is large.

Within the education sector, there were more than 9,600 postsecondary institutions in operation in the United States during the 1997-98 academic year (Korb and Lin, 1999). Just over one-half—more than 5,000—were schools that

TABLE 1

Non-Degree Granting Institutions Outnumber Those Conferring Degrees

Number of postsecondary institutions in the United States, 1997-98. "Title IV eligible" includes institutions eligible to participate in federal financial aid programs.

Type of Institution	Total Number	Percent Title IV eligible
All Institutions	**9,632**	**71%**
Degree granting institutions	4,495	91%
Four-year[11]	2,664	87%
Two-year[12]	1,829	97%
Public	1,096	99%
Private nonprofit	217	85%
Private for-profit	516	97%
Other/did not respond	2	—
Non-degree granting institutions	5,137	53%
Four-year certificate or more[13]	146	39%
Less-than-four-year certificate[14]	4,986	53%
Public	530	86%
Private nonprofit	629	46%
Private for-profit	3,827	50%
Other/did not respond	5	—

Korb and Lin, 1999 (Adapted from Table 1).

[11] Includes institutions whose highest degree offering is a bachelor's or advanced degree.

[12] Includes institutions whose highest degree offering is an associate degree, or a degree program that is greater than two years but less than four years in length.

[13] Includes institutions that do not grant degrees and whose highest programs are post-baccalaureate certificates or post-master's certificates. Those institutions that only offer first-professional certificates are also included.

[14] The majority of these institutions (81 percent) grant less-than-two-year certificates. Only 930 of these institutions offer certificate programs that require at least two, but less than four years to complete.

only offered certificate programs, the majority lasting less than two years *(see Table 1)*. Three-quarters of these certificate-granting institutions were private, for-profit (proprietary) institutions that usually provided programs aimed at aspiring beauticians/cosmetologists, secretaries, health assistants, and trades workers (Berkner, Horn, and Clune, 2000). The majority of the 1,800-plus degree-granting two-year institutions also offered certificate programs in addition to their associate degree programs.

Despite all the clamor about the insurgence of new competitors in postsecondary education, federal data sources report that the number of institutions that offer postsecondary certificates actually has declined in recent years (U.S. Department of Education, 1992-1999). However, all of this decline has occurred among private nondegreed credentialing institutions, not among degree-granting community colleges and other institutions of higher education.[25] Meanwhile, increased competition is coming from an upsurge of branch campuses and satellite and Internet-based distance learning programs that offer the training most in demand (Marchese, 1998).

Many colleges and universities are targeting this in-demand learning by opening convenient urban centers far from their main campuses that offer name-brand education and training (Gose, 1999; Cage, 1989). Web-based and satellite education programs also are growing businesses within existing postsecondary institutions. Technology allows education and training providers to compete without laying a single brick. Other for-profit companies have emerged as education and training coordinators. At this stage, however, alternative and distance providers only claim about 2 percent of the postsecondary market (Marchese, 1998; Strosnider, 1998).

Among the traditional education institutions, less-than-two-year postsecondary institutions enroll only a small proportion of all students seeking additional education or training. Of those students who enrolled in a postsecondary institution in 1995-96, fully one-half enrolled in a two-year college, while only 9 percent enrolled in a school offering less than a two-year program (Berkner, Horn, and Clune, 2000). There appear to be two reasons for this. First, despite their large numbers, each less-than-two-year institution tends to enroll a small number of students. Second, those students who enrolled in community colleges were more likely to seek a degree or transfer credits than a certificate. Only 15 percent of the students in public

[25] In the early 1990s, Congress passed two initiatives—the Student Loan Default Preventative Initiative Act in 1990 and the Higher Education Act amended and passed in 1992—aimed at tightening the criteria that schools must meet to be eligible for Title IV federal financial aid funds. To be eligible for Title IV student aid programs, proprietary schools must provide training to "prepare students for gainful employment in a recognized occupation." These schools also must not garner more than 90 percent of their revenues from Title IV programs, and their student loan default rate cannot exceed 25 percent, if they are to remain eligible to participate in these programs (U.S. Department of Education, 2000). The stiffer regulations effectively eliminated a number of proprietary schools from Title IV eligibility, and many subsequently went out of business. Between 1991 and 1994, 890 proprietary schools were subject to a loss of financial aid eligibility. By 1994, 601 schools had lost their eligibility, while 250 other schools had appeals still pending (GAO, 1995). While the number of community colleges and institutions of higher education has grown slightly, the number of private institutions offering only certificate programs has fallen by about 22 percent since 1992-93 (U.S. Department of Education, 1996 and 1999).

With the huge variety of credentials, certificates, and certications, and the multitude of providers, it is difficult to ascertain the exact size of the market. Available evidence, however, confirms that the market is large.

two-year colleges were seeking a certificate, compared with 65 percent of those enrolled in proprietary schools (Berkner, Horn, and Clune, 2000).

A closer look at students enrolling to earn certificates shows that proprietary school students tend to complete their programs more quickly. Within three years of enrolling to obtain a certificate, over one-half of proprietary school students had attained their certificates. During the same period, only 31 percent of students in public two-year or less-than-two-year schools had attained a certificate, although another 17 percent were still working toward the credential (Berkner, Horn, and Clune, 2000). Proprietary school students are less likely to be working while in school and more likely to enroll full-time, which may explain, at least in part, why they complete their certificate programs more quickly. Five years after enrolling, about 41 percent of the students working toward a certificate in a nonprofit school had received the credential, compared with nearly two-thirds in the proprietary schools (Berkner, Cuccaro-Alamin, and McCormick, 1996).

It is important to note that certificate-seeking students at proprietary schools versus community colleges generally are looking for different kinds of training. Students entering certificate programs at for-profit schools are more likely to enroll in a vocational program, with about one-quarter enrolling in cosmetology programs (Berkner, Horn, and Clune, 2000). By contrast, certificate students at community colleges have the opportunity to earn more education-centered certificates in academic disciplines or to enroll in vocational programs such as those in the medical field.

Credentialing and certification programs succeed in labor markets to the extent that they assure employers that potential employees have mastered specific skills. While links between community colleges and employers are common, they are often intermittent and of low intensity (Grubb, 2000; Bailey, 2000). Less-than-two-year programs appear to have tighter links to industry, and focus more on preparing students to meet specific industry, trade, or professional certifications than do community colleges. Among less-than-two-year institutions,[16] 84 percent indicated that all of their occupational programs prepared students to earn industry-related credentials,[17] compared with only 28 percent of two-year colleges. Nevertheless, 68 percent of two-year colleges

[16] These data are based only on those institutions eligible for Title IV federal financial aid.

[17] Industry-related credentials are defined as company certificates, industry/trade certificates or diplomas, and state registrations, licenses, or certificates.

TABLE 2

Less-Than-Two-Year Schools Are More Focused on Preparing Students for Industry-Related Credentials

Proportion of institutions with programs that prepare students to earn industry-related credentials in all occupational programs. Estimates are based only on those institutions with Title IV eligibility.

Industry-Related Program	Two-year schools	Less-than-two-year schools
Business and marketing occupations	50%	92%
Technical occupations	43%	85%
Mechanical occupations	66%	89%
Building trades	69%	88%
Health/life sciences occupations	41%	89%
Service occupations	52%	84%

Parsad and Farris, 2000.

indicated that at least half of their occupational programs prepared students for industry-related credentials, and 86 percent said at least one program did (Parsad and Farris, 2000). Within each of the different occupational programs offered, less-than-two-year schools were much more likely to prepare their students to earn an industry credential than were two-year colleges *(see Table 2)*.

It should not be surprising, then, that less-than-two-year schools have slightly more consistent industry involvement in curriculum development than do two-year colleges. Among less-than-two-year schools, 72 percent said there was at least some industry involvement in adopting skill competency lists for all of their occupational programs, compared with 57 percent of two-year colleges. However, both less-than-two-year schools and two-year colleges report industry involvement in at least one-half of their occupational programs (Parsad and Farris, 2000).

The Data Gaps

National education statistics reflect the change that occurs in higher education institutions, but they do not capture many of the changes that occur in institutions that do not grant degrees, nor the more rapid change that has occurred outside of the postsecondary sector. For example, in 1996-97, more than 612,000

sub-baccalaureate certificates were awarded, accounting for about one-fifth of the postsecondary credentials conferred by those schools eligible for financial aid[18] *(see Table 3)*. But because the U.S. Department of Education only collects data on degree and certificate completions for those institutions eligible for Title IV federal financial aid programs, federal data sources significantly understate the number of certificates granted by less-than-two-year institutions. In fact, only about one-half of less-than-two-year, nondegree-granting institutions are eligible for federal financial aid programs *(see Table 1, page 32)*.[19]

Many of the certification functions, and indeed many of the new certification areas, occur *outside* of the postsecondary institutions for which the U.S. Department of Education collects data (Adelman, 2000). The certifications conferred by national industry, trade, and professional associations, such as the

[18]There is some indication that the number and share of certificates conferred by Title IV eligible postsecondary institutions has declined in recent years; however, because of changes in data collection and reporting definitions, the data from earlier years are not directly comparable with recent data (U.S. Department of Education, 1992-1999).

[19]The Integrated Postsecondary Education Data System (IPEDS) survey administered by the National Center for Education Statistics, U.S. Department of Education, collects information on the number of all postsecondary institutions whose primary mission is to provide education or training beyond the high school level. However, the survey only collected data on certificate and degree completion from those institutions deemed eligible for Title IV federal financial aid.

[20]Certificates conferred by institutions that are not eligible for Title IV financial aid programs are not included in these data. Also excluded are certificates and certifications conferred by industry, trade and professional associations.

TABLE 3

Certificates Account for about One-Fifth of All Postsecondary Credentials

Credentials awarded by postsecondary institutions in the United States and outlying areas, 1996-97[20]

Award Type	Number of awards	Share of all awards
Total	**2,943,023**	**100%**
Certificates	630,202	21%
Less than one year	299,919	10%
≥ one year, but less than two	276,383	9%
≥ two years, but less than four	36,174	1%
Post-baccalaureate certificates	8,535	<1%
Post-master's certificates	8,696	<1%
First-professional certificates	495	<1%
Degrees	2,312,821	79%
Associate degrees	577,398	20%
Bachelor's degrees	1,188,385	40%
Master's degrees	421,523	14%
Doctoral degrees	46,052	2%
First professional degrees	79,463	3%

U.S. Department of Education, 1997 (Table C).

Automotive Service Excellence certification, and company vendors, such as IT giants Microsoft, Cisco, Novell, and Sun, are not included in federal data because their primary mission is not education and training. They simply maintain education requirements and/or offer an exam to assess knowledge and confer nondegreed credentials.

The number of professional, industry, and trade organizations offering certification has grown substantially over the past several decades, from about 120 in 1965 to more than 1,600 in 1996 (National Organization for Competency Assurance, 2000). A survey of more than 1,500 associations reports that 26 percent offer a program leading to certification or licensure. The survey shows that, on average, 25 percent of an association's members participate in its certification program (American Society of Association Executives, 1996).

Traditional data also exclude the most rapidly growing training sector—"corporate universities," which now number about 1,600 (Gerencher, 1999). These "universities" are excluded from the data because they are typically part of a company whose primary function is not education and training. It would be difficult, however, to view them as true competitors of other postsecondary providers because they typically teach corporate culture or provide training tailored to the specific needs of the corporation. Only a select few offer their own degrees or contract training, but nearly two-thirds have alliances with education institutions that offer their workers training and degrees (Meister, 1998; Cobb and Nelson, 1999).

National education statistics reflect the change that occurs in higher education institutions but miss both changes in institutions that are not degree-granting and the more rapid change occurring outside the postsecondary sector.

Because of the limits on the federal data collection system, data on the number of industry, trade, professional, and vendor certifications are difficult to obtain. But the growth in IT certification providers alone is impressive. One decade ago, there was only one IT certification, the Certified Novell Engineer (CNE). By 1999, there were nearly 300 different IT certifications and more than 2.4 million certificates conferred (Adelman, 2000).

Certification is also growing in other sectors. One of the largest professional certification programs, the National Institute for Automotive Service Excellence, lists 420,000 workers with current certifications (National Institute

for Automotive Service Excellence, 2000). The American Nurses Credentialing Center provides certification to registered nurses in 30 specialty areas; since 1991, more than 150,000 registered nurses have earned a specialty or advance practice certification (American Nurses Credentialing Center, 2000). In the past two decades, more than 100,000 child care workers have received the Child Development Associate credential, and two new child care certifications have emerged (Council for Early Childhood Professional Recognition, 2000; National Child Care Information Center, 1995). So although many certification providers are not included in the traditional educational sector, they are significant contributors in the credentialing market.

Credentialing in Child Care: Early Childhood Education and Out-of-School Time Programs

With the increase of women in the labor force, one of the most pressing social issues in our country is child care. Most of today's parents are confronted with child care dilemmas not faced by their own parents—in 1970, only 40 percent of married women were in the labor force, compared with 71 percent in 1997 (Bureau of Census, 1998). The need for additional and improved child care extends from early childhood care to the care of school-age children during nonschool hours. With the increasing number of children in nonparental care, the demand for quality child care has magnified and is impacting the role of credentialing in the field.

The most significant shift in child care is that more training is necessary now than in the past. The response from workers has been a shift toward for-credit courses, and more students attending community colleges for certificates or degrees, not just one or two courses. Recently, for-profit companies have emerged as players in the child care arena as well; they concentrate primarily on preparing students for one of the national certifications. There are three national credentialing programs in early childhood education; they differ substantially from completing a community college certificate program in that they incorporate experience, evaluations, a national exam, and other evaluative processes into the certification. The Child Development Associate (CDA) program began in 1971 and today, there are more than 100,000 holders of this credential.

Within the past decade, the Certified Childcare Professional and the Certified Professional in Early Childhood Development national credentialing programs also have been established.

Legislative changes also have affected the demand for more skilled workers. The Human Services Reauthorization Act of 1998 states that by 2003, at least 50 percent of all Head Start teachers must have at least an associate degree in early childhood education or development, or a related degree with preschool experience. While the majority of states do not require child care workers to have a credential, some states do stipulate training requirements. In nearly one-half of the states, teachers in child care centers are required to have some type of pre-service training. Furthermore, the majority of states have center licensing standards that require staff to receive a set number of training hours each year (Center for Career Development in Early Care and Education, 2000).

There also is a push to promote quality curriculum in community college's early childhood credentialing programs. The National Early Childhood Associate Degree Program Approval System seeks to recognize those programs that meet the early childhood profession's national standards. The Program Approval System is the result of a joint partnership between the American Associate Degree Early Childhood Educators (ACCESS) and the National Association for the Education of Young Children (NAEYC), the latter of whom administers the CDA credential. Community college program approvals are based on how well they meet the early childhood profession's standards for the preparation of early childhood professionals.

Programs focusing on older children also are a recent development in the child care field. There have been a limited number of programs developed to train workers for "out-of-school time" programs aimed at school-age children. The majority of these programs have been developed in conjunction with local community colleges and result in a certificate (Costley, 1998). The profession is working toward building a professional development system for the out-of-school time field (Costley, 1998; Morgan, 1998). For example, the MOST (Making the Most of Out-of-School Time) program was piloted in four cities and a program is now

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underway to offer training and a credential through local colleges. The BEST (Building Exemplary Systems for Training Youth Workers) program is currently working in 15 communities, primarily with community colleges, to develop training programs for "youth workers," those workers employed in youth development agencies such as the YMCA and Boys and Girls Clubs.

The child care industry is an area of evolving professional development. The contentious issues of quality, quantity, and compensation all play into the development of credentialing systems in child care. Given the national labor market for child care workers, community colleges are the natural choice for the dissemination of a credentialing system in this field.

PART 3: Consequential Effects of a Knowledge Economy

Much of the recent interest in credentialing and certification in the United States stems from a systemic shift in our society toward performance measurement and performance standards in human capital development. The changing economy plays the leading role in this increased emphasis on results. The labor market places higher value on knowledge and applied skill. In turn, employers demand workers who demonstrate these skills.

The increasing value of knowledge, especially at postsecondary levels, has come as a bit of a surprise. Fears that the 1970s decline in the local manufacturing economy would turn the United States into a low-paid, low-skilled nation of hamburger flippers did not come true. Today, the fastest job growth is occurring in the services sector, especially high-skilled office jobs in areas such as management, finance, marketing, business services, education, and health care. The salaries of these highly paid workers are rising, not falling. Technical jobs, which receive the most attention from the media, also are growing fast, but represent a small share of all jobs.

The knowledge economy at the core of these new education and skill requirements on the job is driving the increasing demand for all forms of education and skill certification. As the value added from knowledge increases, so does the value of learning in all its forms: general education, job-specific training, and technology-specific training. Lifelong learning is now a key component of the knowledge economy. As knowledge becomes the fuel that drives economic growth and distributes economic opportunity, the pressure to increase workers' human capital grows inexorably.

Lifelong learning is a key component of the knowledge economy. As knowledge becomes the fuel that drives economic growth and opportunity, the pressure to increase workers' human capital grows inexorably.

Lifelong Learning

These days, lifetime employment at the same institution is as out of style as gold watches at retirement. A career is no longer defined by working for one company, but by moving among employers within

an industry or occupation[21] (Neumark, 2000). Workers change jobs more often, and employers, constantly changing form in response to economic and technological change, are always looking for new talent. As a result, lifelong learning is necessary for managing a successful career.

Technology is a primary galvanizing force behind lifelong learning. Technology demands continual upgrading of skills, not only in IT occupations, but also in technology-enabled jobs in offices, hospitals, and factories.

Technology is a primary galvanizing force behind lifelong learning. Technology demands continual upgrading of skills, not only in IT occupations, but also in technology-enabled jobs in offices, hospitals, and factories. With Microsoft releasing a new version of its suite of MSOffice products every other year, workers must keep pace with these changes or face increasing difficulty working with users who have upgraded to more sophisticated software packages. Technology also affects hospitals and factories, as they require new machinery. As more efficient production methods and machines make their way to the plant floor, factories face technological upgrades. Workers are likely to need more technology-related skills to operate the complex machinery, but fewer of the physical and vocational skills built into today's automated assembly line. In the health professions, workers still need solid science skills but now also must know how to work with computers and sophisticated machinery. Today, their skills must keep pace with advances in both medicine and technology.

In the new economy, the matching of individual talents to emerging employer needs is less often based on mutual knowledge built up through long-term relationships. Nor, as change accelerates on the job, can employers take the time to develop talent from the ground up (Cappelli et al., 1997). As relationships between employers and employees become less stable and as the pace of change accelerates, reliable credentials become more important in matching individual skills to new job requirements. Employers want to hire workers with strong certified skill thresholds, and then complement that basic foundation with limited amounts of training specific to the industry, the company, or changes in work processes or technology. In other words, they want to hire the most training-ready employees, those with certified skills, and then add job- or company-specific training (Bishop, 1996). In fact, employers who spend lots of money on training are fearful that trained employees will be pirated away by other employers who train less, choosing instead to spend their money on wages and benefits to attract highly trained employees from their competitors[22] (Cappelli et al., 1997; Lynch, 1994).

[21] Job stability declined during the 1970s and early 1980s. Throughout the majority of the 1980s, there was little change. But during the 1990s, the bonds between workers and employers weakened again. The decline in job stability during the 1990s, however, occurred primarily among high-tenure and managerial and professional workers. There was little increase in short-term job turnover. Most evidence also concludes that job security has declined since the 1970s, with more workers fearing involuntary job loss, although it is not clear that this has continued in the 1990s (Neumark, 2000).

In some respects, the new sense of job insecurity stems from a change in expectations. In the 1950s, rela

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The shift to a knowledge economy and increased emphasis on performance outcomes have changed the way workers are viewed by employers. Those with specific occupational skills will need to stay current with advances in their field, and those workers with solid general skills are the best prepared to learn. As technology becomes more important in all sectors of the economy, workers need a broad familiarity with technological skills more than ever before. Workers who also have a solid base of general knowledge and current occupational know-how become more portable, since their value is internalized in their individual experience and credentials and not tied to a particular company. An associate or bachelor's degree is more likely than a high school diploma to ensure these basic transferable skills. However, employers often look for evidence of specific applied skills on top of the general cognitive skills a postsecondary degree often represents. The validation conferred by certification examinations attracts employers, leading to the multiplication of certification programs in some professions.

In a more dynamic labor market, employees need to be more loyal to their own certifiable skills than to their employers. Employees are now in charge of their own careers and need to accrue certifiable skills that will allow them to use skills learned on one job with one employer to get the next job with another employer. Workers must continually upgrade their skills and need documented evidence of those skills when they apply for the next job.

The need for certified skills also is driven by the geographic extension of labor and product markets. Product markets, and to a more limited extent service markets, have extended their boundaries from local to regional, from regional to national and, in some cases, from national to global markets. The principal effect of the expanding geography of markets on workers is not to increase geographic mobility but to raise skill requirements from local to, ultimately, world-class standards (Porter, 1998; Kanter, 1997).

The increase in skill requirements, especially in the need for lifelong learning, has a greater impact on the demand for nondegreed credential and certification programs than for degreed programs. Learning is less linear than it used to be. Workers now seek "blocks" of skills at different times throughout their careers, and they want evidence of their skills when changing jobs. Nondegreed credential and certification programs provide smaller "blocks" of learning that build on more general skill. Because of this

tively few workers looked forward to lifetime employment with health and retirement benefits. At the same time, most workers thought that lifetime security was expanding from union and government workers to eventually include a larger share of the workforce. Moreover, workers associated higher skills with job security. Since the 1970s, expectations of expanding lifetime employment have virtually disappeared in spite of the fact that education levels have risen (Kochan, 2000; Reich, 2001).

[22]Employers are under growing pressure to conduct more on-the-job training or offload training costs to public educators and individuals. The intensity of change in technologies, work processes, and business conditions increases on-the-job learning needs and encourages employers to hire better-skilled workers because of their adaptability. Higher-skilled workers can adapt on their own and are more easily trained, should formal training become necessary. Indeed, one of the best indicators of the intensity of economic change and resultant training needs is the growth in educational attainment of workers hired and the rate of technological change in particular industries. Employers have increased the educational attainment of their employees substantially over the past decades and are projected to do the same over the foreseeable future (Braddock, 1999). Nevertheless, even though employers are hiring more skilled workers, the intensity of economic and technological change on the job has forced a steady increase in training among employers and the increase is expected to continue (Carnevale and Desrochers, forthcoming; McGranahan, 2000).

Learning has become less linear: Workers now seek "blocks" of skills at different times during their careers and want evidence of their skills when changing jobs. As a result, lifelong learning's greater impact will be on credentialing programs that convey new job-related skills, as in the IT field, rather than on initial-entry programs such as nursing.

emphasis on skill-building, lifelong learning will have a greater impact on those credentialing programs that facilitate the acquisition of new job-related skills, as in the IT field, than on initial-entry programs, such as nursing.

As the introduction of continuing education credentials gains momentum, many professional certifications already have instituted, or are instituting, requalification or continuing education requirements (American Society of Association Executives, 1996). These force already certified workers to engage in the changes in their profession, which maintains the integrity of the credential they hold. These requirements have little impact on programs that offer only an initial credential in the field. Nonetheless, they do open up avenues for expanding course offerings that shore up the credential against changes in the profession.

Technology not only increases skill requirements, it also helps individuals acquire new skills. In general, technology not only makes learning accessible, it can improve quality and convenience for learners. Technology is especially helpful for adult students because it makes learning less dependent on particular times and places. This added flexibility allows adult students to balance work, family, and learning needs.

Many community colleges and for-profit credentialing programs already have the infrastructure to provide technology-enhanced education and training, and providers are moving to a technology-centered delivery platform. While many professional certification programs do not provide direct education or training, they still can take advantage of technology in administering assessments. For example, the National Council of State Boards of Nursing and the National Council of Architectural Registration Boards already administer their licensure exams by computer in collaboration with private for-profit testing centers.

Distance learning and web-based training also have blossomed (Marchese, 1998). Although they comprise a minority of training delivery systems, their existence has challenged the future role of traditional classroom-based instruction. Two-year educational institutions, with their diverse programs and students, will

confront these changes sooner than the four-year institutions, which are buffered against this change by their more traditional student body and longer baccalaureate programs. In an Internet-driven "I want it now" economy, students are looking for the most convenient outlet for buying their education and training.

The Economics Driving Credentialing

The increasing importance of technology and lifelong learning is a consequence of changes in the structure of the economy. The concentration of jobs in the United States today is radically different than it was in 1959 (Carnevale and Rose, 1998). The way we work each day has changed dramatically from the way our parents and grandparents spent their day. Hard work fifty years ago was more about welding on the assembly line than creating a PowerPoint presentation. Factory jobs have declined precipitously from 32 percent of all jobs in 1959 to 17 percent of jobs in 1997 *(see Figure 1)*. Farm jobs also have decreased. The overall share of low-skilled, low-wage jobs has not grown significantly since Dwight D. Eisenhower was president. Moreover, almost 30 percent of those in these low-skilled services jobs are under the age of twenty-five and will move out of these jobs as they mature and complete their educations.

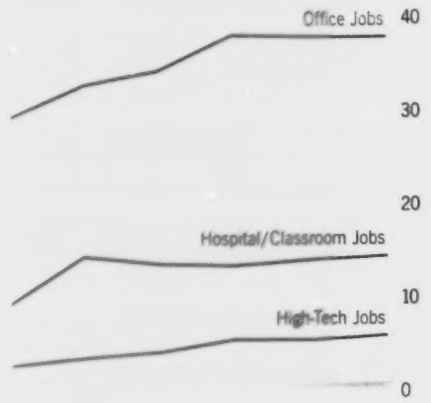
So, where are all the new jobs being generated? Daily newspapers and nightly newscasts have suggested the economy is a high-tech job machine. While the share of high-tech jobs has doubled, they still account for only about 7 percent of all jobs in the economy. While our work is becoming more high-tech, the technology sector has not generated as many new jobs as other parts of the economy, accounting for only 10 million of the 133 million jobs in the economy. Improvements in technology itself mean that fewer workers are needed to make, maintain, or repair the technology that more and more of us use because the new technology is more user-friendly (Carnevale, 1999).

FIGURE 1

Education and Occupation, 1959–1997

Percent of total employment

More than two-thirds of workers in growing, good-paying occupations have postsecondary education:



Only one-third of workers in these declining or low-paying occupations have postsecondary education:

Authors' analysis of 1960 Census and Current Population Survey (March 1970–March 1998).

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The greatest increase in jobs has occurred in the nation's offices. In 1997, the nation's 51 million office jobs comprised 38 percent of all jobs, up from just 30 percent in 1959. Offices are expected to add 4 million new jobs by 2006, compared to the 750,000 expected in the closely watched IT sector.

Although the high-tech industry continually laments the lack of high-tech workers, the evidence of a shortage of skilled IT workers is mixed (Lerman, 1998; Ellis and Lowell, 1999; National Research Council, 2000; Freeman and Aspray, 1999). Employment growth has been rapid in some but not all IT occupations, and the spike in demand for workers has geographic variants that may affect the recruitment of workers from other areas. For example, the high cost of living in the Silicon Valley areas may give workers pause before they accept a job offer.

While unemployment rates are very low in IT occupations, the unemployment rates for other professional specialty workers are only slightly higher. Similarly, wage growth in IT occupations has increased at the same rate, or only slightly faster, than in other professional occupations (Lerman, 1998; Freeman and Aspray, 1999). However, federal wage data do not include stock options and signing bonuses—significant factors in IT employment—and anecdotal stories of recruitment and retention difficulties abound. Whether there is an actual shortage of high-tech workers is still a subject of debate, but there is general agreement that IT employers are facing a tight labor market (National Research Council, 2000).

Productivity has not been rising as quickly in the education, health care, and office sectors as in the high-tech sector. In other words, new technology and work processes have not reduced the number of workers it takes to provide education or health care. Job growth has occurred in health care and education, increasing from about 10 to 16 percent of all jobs since 1959. As a direct result of the aging baby boom's health care needs and increased educational requirements, health care has grown from 4 to 8 percent and education from 6 to 9 percent of all jobs.

The greatest increase in jobs has occurred in the nation's offices, whether situated on street corners or in business campuses around the country. In 1997, there were 51 million office jobs in the economy, or 38 percent of all jobs, up from just 30 percent in 1959 (Carnevale and Rose, 1998; Carnevale, 1999). The majority of these office jobs are filled by the best-paid workers in management, accounting, sales, marketing, and other professional occupations. Putting this in perspective, offices are expected to add 4 million new jobs by 2006, compared to the 750,000 expected in the closely watched information technology sector.

Credentialing in Information Technology: Moving at the Speed of Light

It's fair to say that most of the general public's interest in credentialing has resulted from the rapidly changing field of information technology and the promise of big salaries upon obtaining an industry or vendor certification. But how big a role does credentialing play in preparing workers for a career in IT? Approximately 50 major corporate vendors, industry associations, and proprietary training partners offer about 350 criterion-referenced IT certifications. By January 2000, the primary certification providers had awarded more than 2.4 million credentials to about 1.6 million people (Adelman, 2000). However, most of the IT certifications are not targeted toward those in the "core" IT occupations. Instead, they are conferred upon those in the lower levels of this high-skilled sector.

The topography of IT jobs varies considerably by function and education requirements. Within IT, *conceptualizers* who conceive the basic nature of a system usually have master's or doctoral degrees. *Developers* work on specifying, designing, constructing, and testing an IT artifact, while *modifiers and extenders* modify or add information to the IT artifact—these workers usually have a master's or bachelor's degree, although some modifiers and extenders hold associate degrees (Freeman and Aspray, 1999). Workers with these functions are generally employed in "core" IT jobs, including computer scientists and engineers, systems analysts, and computer programmers.

The remaining IT workers, *supporters and tenders*, deliver, install, operate, maintain, and repair the IT artifact; these jobs are most commonly filled by people with associate degrees (Freeman and Aspray, 1999). While there are many different types of certifications at various levels of difficulty, it is these IT workers, employed in jobs such as network installers and help desk specialists (and core IT workers employed as programmers), who are most likely to obtain certification.

Among the "core" IT occupations, it is estimated there are about 2.5 million workers and at least another 2.5 million IT workers engaged in configuration or support positions. Upper-bound estimates suggest that

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overall there may be as many as 10 million IT workers (National Research Council, 2000). Employment in the "core" IT occupations rose by 34 percent between 1994 and 1999 (compared to 9 percent for employment overall), and most of these workers came out of the college pipeline. Among the 700,000 new workers, 72 percent held a bachelor's or graduate degree, while only 3 percent had an associate degree. Among the remainder, 17 percent had some postsecondary education or training, perhaps a certificate but no degree, while another 8 percent had a high school diploma (Lerman, Riegg, and Salzman, 2000). While the majority of IT workers come from the higher education pipeline, many do not come from IT majors. Only one-third of workers in computer science or programming jobs in 1993 had majors in computer science. The remainder came from math, engineering, business, and other education backgrounds (Freeman and Aspray, 1999).

Although the sub-baccalaureate workforce is already less likely to be employed in the "core" IT occupations, its presence also appears to be declining.[23] Among young workers aged 25 to 34, the share of IT workers with an associate degree declined from 12 to 8 percent between 1994 and 1999, while the share with some college but no degree increased from 11 to 14 percent. The net effect was a decline of 1 percentage point (Lerman, Riegg, and Salzman, 2000).

While students preparing for community college certificates and associate degrees or vendor certifications in IT are entering relatively high-skilled occupations, those occupations they have access to are the least skilled within the IT field (Freeman and Aspray, 1999). In fact, Microsoft certifications increasingly are going to younger workers with less education. In 1996, for example, 44 percent of certification holders were under the age of 35. By 1998, that figure had risen to 58 percent. During the same period, the proportion with less than a bachelor's degree increased from 19 to 37 percent (Adelman, 2000).

Despite the relatively small number of community college students in the core IT occupations, community colleges report a substantial amount of IT training. The bulk of this training is provided to those entering noncore IT jobs. However, community colleges also provide a substantial amount of IT retraining, primarily to workers already in IT jobs, those making mid-life career changes, and those who already have

[23] Analyzing employment in noncore IT jobs would probably result in a larger share of associate degree holders or workers with only some college. However, it is almost impossible to map these narrowly defined occupations into the categories covered by government datasets. As a result, general characterizations about those employed in the noncore IT labor market are not available (National Research Council, 2000).

a more general, but less vocational, bachelor's degree in an IT-related field (Lerman, Riegg, and Salzman, 2000). Community college credentials and vendor certifications also are used to ensure that workers have the most up-to-date technical skills needed on the job.

So why has credentialing become more prevalent in IT than in other sectors? First, the speed of change in the industry surpasses that of other industries. Opportunities presented by technological advances and competition have driven companies to release new products on a very short schedule—an IT company's product line completely turns over in about four years (Freeman and Aspray, 1999). The pace of technological and new product development requires that even workers with general and theoretical IT knowledge keep their practical skills up-to-date.

Second, IT certifications are truly a performance-based assessment of skill. In today's tight technology labor market, workers are rewarded for precisely these skills. There are no educational requirements that must be met prior to sitting for a certification exam, and those certified have met a criterion-referenced standard of performance, not just "seat time" or a subjective grade from an instructor. Furthermore, there is no requirement that those preparing for a certification attend any type of formal training. Among Microsoft certificate holders, for example, 97 percent prepared through self-study and 91 percent used manuals. A 1998 study indicated that 43 percent of IT certification candidates prepared primarily through self-study (Adelman, 2000).

Third, IT certification is training not education. Credentials may get you past the human resources department, but performance keeps you on the job. In a field as rapidly changing as IT, certifications signal that workers have relevant skill sets.

Although community colleges are not currently the primary educators of the core IT workforce, an increasing number of schools offer IT associate degree programs. In the meantime, most community colleges do offer courses for workers looking to stay current with rapidly changing IT technologies. Often, they work with corporate vendors to provide training for their external certification exams.

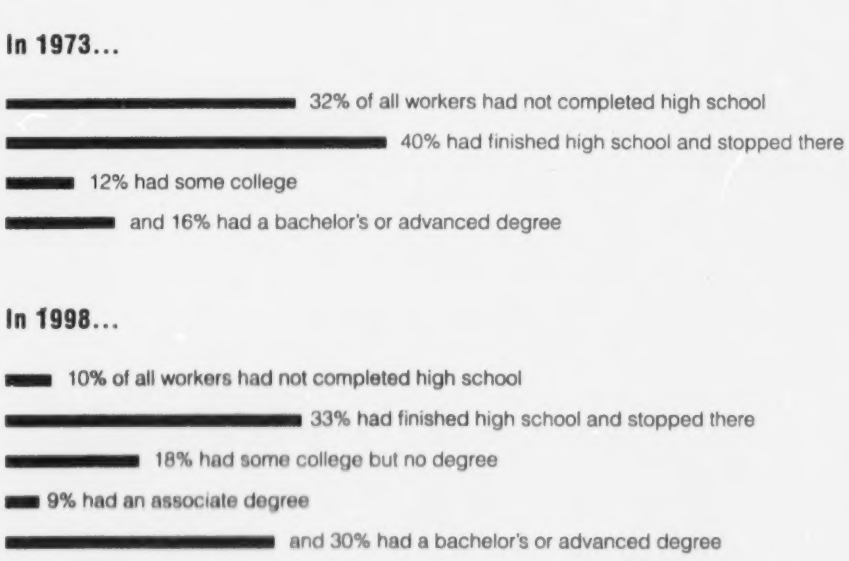
While jobs have been shifting over the past 40 years from farms and factories to offices, hospitals, and classrooms, skill and educational requirements have been rising.[24] In 1973, only 28 percent of prime-age workers[25] had any postsecondary education *(see Figure 2)*. Today, 57 percent of prime-age workers have attended some type of postsecondary institution. In fact, the proportion of workers with an associate degree, certificate, or some college has more than doubled from 12 to 27 percent of the workforce—9 percent hold an associate degree, while 18 percent have a certificate or some college coursework but not a degree.

The sectors of the economy with the most educated workers are growing the fastest, increasing the demand for credentials and degrees. High-tech jobs employ some of the most educated workers. In 1998, 86 percent of prime-age

FIGURE 2

Most Jobs Now Require Educational Attainment Beyond High School

Percentage of prime-age workers in each educational category


In 1973...
32% of all workers had not completed high school
40% had finished high school and stopped there
12% had some college
and 16% had a bachelor's or advanced degree
In 1998...
10% of all workers had not completed high school
33% had finished high school and stopped there
18% had some college but no degree
9% had an associate degree
and 30% had a bachelor's or advanced degree

Authors' analysis of Current Population Survey (March 1974 & 1999).

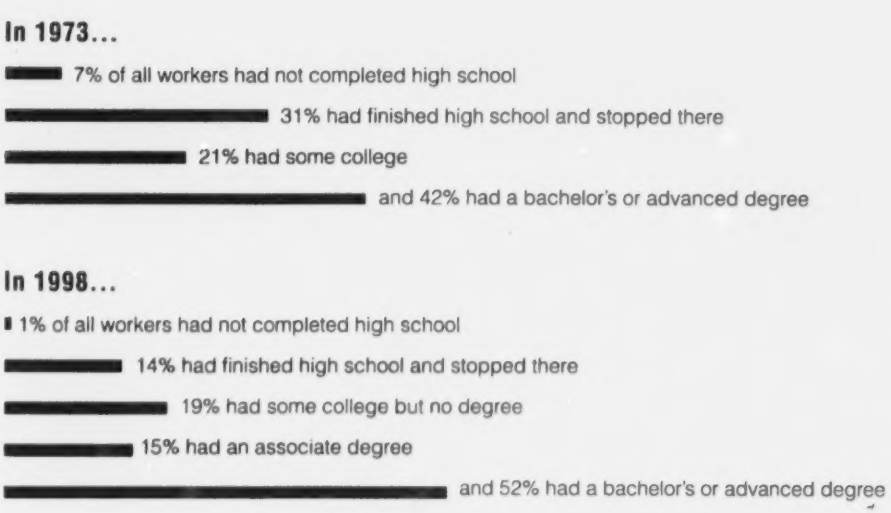
[24] A debate exists over the extent to which skills and skill requirements have increased in the economy. Different measures of skills often result in different outcomes (see Cappelli, 1993 and 1996 for a review of this literature). However, the balance of the literature that examines wage inequality and supply and demand shifts concludes there has been an increase in skill requirements in the economy (Autor, Katz, and Krueger, 1997; Katz and Autor, 1999; Katz and Murphy, 1992; Murphy and Welch, 1993; Goldin and Margo, 1992; Juhn 1999; Levy and Murnane, 1992; Johnson, 1997; Topel, 1997; and Gottschalk, 1997). Some occupational analyses support the upskilling thesis, while additional evidence suggests that upskilling in some occupations is offset by deskilling in others (Cappelli, 1993; Teixeira and Mishel, 1993). While the evidence that uses direct skill measures concedes there has been an increase in skill requirements, it points out that the changes are not exceedingly large and have slowed dramatically since 1960 (Mishel and Teixeira, 1991; Mangum, 1990; Barton, 2000).

[25] Prime-age workers include those aged 30 to 59.

FIGURE 3

Within High-Tech Jobs,
Educational Requirements Have Risen Substantially

Percentage of prime-age workers in each educational category


In 1973...
7% of all workers had not completed high school
31% had finished high school and stopped there
21% had some college
and 42% had a bachelor's or advanced degree
In 1998...
1% of all workers had not completed high school
14% had finished high school and stopped there
19% had some college but no degree
15% had an associate degree
and 52% had a bachelor's or advanced degree

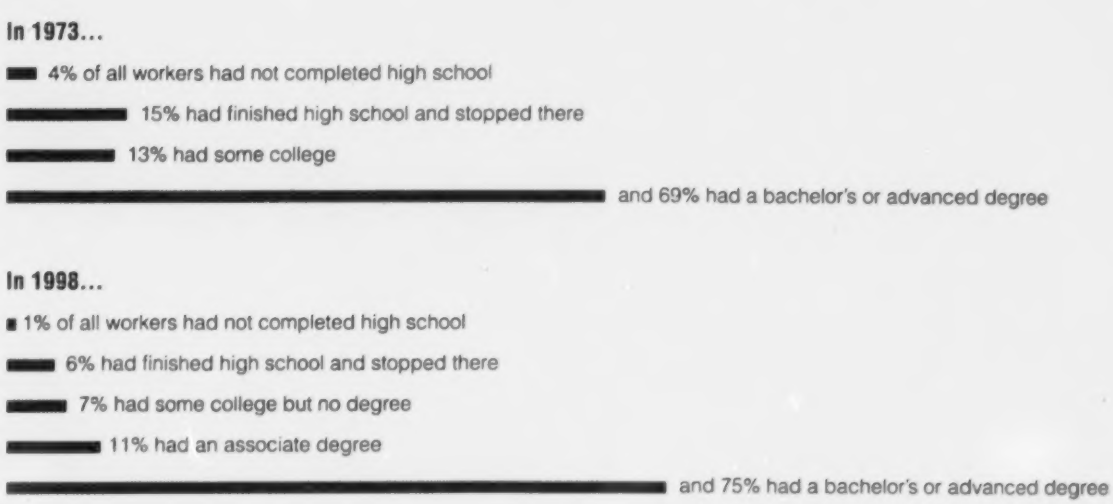
Authors' analysis of Current Population Survey (March 1974 & 1999).

high-tech workers had attended a postsecondary institution, up from more than 60 percent in 1973. Nineteen percent of high-tech workers in 1998 had coursework but no degrees, while 15 percent had associate degrees and more than one-half had bachelor's degrees *(see Figure 3)*. Meanwhile, education and health care professionals always have had the highest educational attainment. Ninety-three percent of prime-age workers in health care and education have some postsecondary training—three-quarters have bachelor's degrees, 11 percent have associate degrees, and 7 percent have coursework or certificates *(see Figure 4, next page)*. Within offices, managers and professionals also have increased their education. In 1998, 8 percent of prime-age workers had associate degrees and 19 percent had a certificate or coursework but no degree, while more than one-half had a four-year degree or more. Nearly eighty percent of these workers have some postsecondary education, up from almost 60 percent in 1973 *(see Figure 5, page 53)*.

FIGURE 4

Education and Health Care Professions Have Always Had High Educational Requirements

Percentage of prime-age workers in each educational category


In 1973...
4% of all workers had not completed high school
15% had finished high school and stopped there
13% had some college
and 69% had a bachelor's or advanced degree
In 1998...
1% of all workers had not completed high school
6% had finished high school and stopped there
7% had some college but no degree
11% had an associate degree
and 75% had a bachelor's or advanced degree

Authors' analysis of Current Population Survey (March 1974 & 1999).

Earnings Returns to General and Specialized Skills in a Knowledge Economy

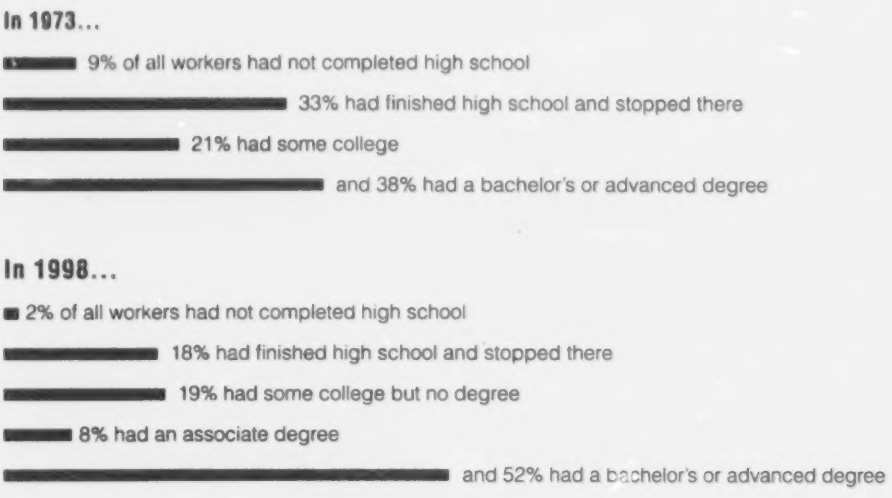
Certification and nondegreed credentialing programs are troubling to some traditional educators who believe the mission of the community college is to provide less prepared students with the necessary foundation to pursue higher education. Traditional educators view learning as an exploratory process that rounds out a student's development.

More career-oriented educators, however, view learning as preparation for work. But even these more work-oriented educators tend to support broad academic preparation over narrow skill certificates or certifications. In their view, placing increased importance on job-related credentialing may mean that some students forego valuable general skills, and

FIGURE 5

Among Managers and Business Professionals, Educational Requirements Have Increased Dramatically

Percentage of prime-age workers in each educational category


In 1973...
9% of all workers had not completed high school
33% had finished high school and stopped there
21% had some college
and 38% had a bachelor's or advanced degree
In 1998...
2% of all workers had not completed high school
18% had finished high school and stopped there
19% had some college but no degree
8% had an associate degree
and 52% had a bachelor's or advanced degree

Authors' analysis of Current Population Survey (March 1974 & 1999).

narrow their career options and their ability to adapt to changing skill requirements.

The available evidence tends to support their view. The workers who have benefited the most from an increasing earnings premium since the late 1970s are those with a bachelor's degree, often a well-rounded liberal arts education.[28] At the same time, however, for those with less than a four-year degree, postsecondary training in an applied field yields the greatest economic opportunities (Grubb, 1999b; Pascarella, 1999). The conundrum is this: Is it better for workers to have a broad base of general skills or a more specialized skill?

Clearly, the relative returns to a broad-based education have been rising since the late 1970s. The college-wage premium—the earnings advantage of college-educated workers over high school graduates—in 1979 was 36 percent for men and 34 percent for women. By 1997, however, the premium rose to 67 and 72

[28] While men with advanced degrees have in fact seen real earnings increases, men with bachelor's degrees have only realized slight increases in real earnings *(see Figure 6, page 55)*. Among men with associate degrees and "some college," real earnings have fallen. But because of the dramatic decrease in the real earnings of high school graduates, the relative returns to all postsecondary education have been increasing. For women, earnings have increased both in real and relative terms for workers with a high school diploma or more (Hecker, 1992; Mishel, Bernstein, and Schmitt, 1999; Mishel and Teixeira, 1991).

The demand for college-educated workers has been rising since the 1970s in spite of the fact that the supply of college-educated workers has increased. Because of the increasing supply of college graduates during the 1970s, the increasing demand for educated workers was not evident in wage data until the supply of new college graduates tapered in the 1980s and the wage premium rose. The slowdown in the growth of college graduates was not large enough to cause the observed increase in the college-wage premium. Increased skill requirements have accounted for just over one-half of the growing college-wage premium (Katz and Murphy, 1992).

Although the difference between college and noncollege wages remains high, the supply of college-educated labor surged in the 1990s and could cause the increase in the college-wage premium to stop growing (Gottschalk and Pizer, 1999).

percent for men and women, respectively. For those with "some college,"[27] the wage premiums also have doubled, although they remain far below the premiums for four-year college graduates. In 1997, men with some college earned 12 percent more than those with high school diplomas, up from just a 6 percent wage premium in 1979. The earnings premium for women is slightly higher, an advantage of 16 percent in 1997, up from 10 percent in 1979 (Mishel, Bernstein, and Schmitt, 1999).

Wage trends among men and women have varied for those with different levels of education. Among prime-age women, earnings at all levels of educational attainment have risen, but the earnings of those at the top of the educational ladder have grown the fastest *(see Figure 6, facing page)*. The earnings of prime-age women with some college, but less than a four-year degree, have increased by 26 percent since 1979. The earnings of prime-age men with at least a bachelor's degree also have increased, but at a slightly slower rate. However, the earnings of men with only some college have fallen by 8 percent since 1979. The earnings of male high school graduates have fallen even more precipitously in the past two decades. For men, the best defense against a decline in earnings is a good offense: going to college.

On average, workers with associate degrees earn less than those with bachelor's degrees, but 83 percent of workers with associate degrees earn the same as workers with bachelor's degrees *(see Figure 7, page 56)*. Nevertheless, this earnings distribution can mask pay differentials that exist in certain occupations. Even though some associate degree holders may earn the same or more than bachelor's degree holders, those associate degree holders may be employed in an industry with higher relative wage rates, have more years on the job, or have higher skill levels.

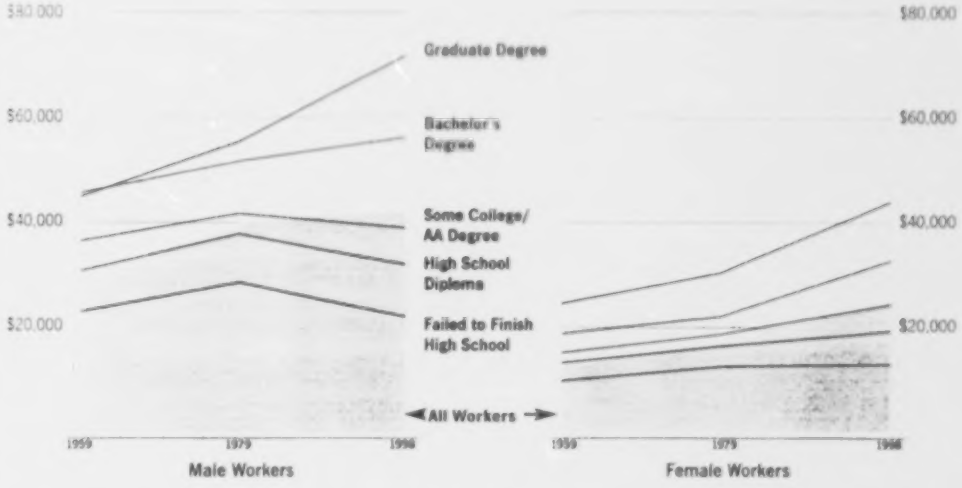
The returns to obtaining a credential are more clearly observed by examining workers' earnings after separating the contributing effects of their different characteristics, such as their gender, race, occupation, experience, and geographic location. All other things equal, an associate degree generally provides workers with a wage boost of about 20 to 30 percent over a high school diploma; the returns for women are generally higher than for men. Workers with bachelor's degrees usually earn another 10 to 20 percent, bringing the returns for men to about 20 to 40 percent above high school graduates, and for women, 30 to 40 percent more (Grubb, 1999b; Pascarella, 1999).

[27] The earnings premium for workers with certificates is difficult to determine because the data generally combine those workers with "some college"—associate degrees, community college certificates, proprietary school coursework, and those who have left any postsecondary institution prior to receiving a degree or certificate.

FIGURE 6

Earnings Depend Increasingly on Educational Attainment

Earnings of prime-age workers (30-59 years old) in 1996 dollars



Authors' analysis of Current Population Survey (March 1980 & 1999) and Public Use Microdata Sample, 1960 Census.

There is little data on the returns to community college certificates, but from what exists, few positive wage effects were found (Grubb, 1999b). Most of the studies that have examined the returns to certificates found that they are not significantly higher than those of high school graduates. Only one study found significant returns to vocational certificates, but the returns appeared to be declining for men. The wage advantage of male certificate holders over high school graduates fell from 22 percent in 1984, to 15 percent in 1987, to no statistically significant effects in 1990. For women, the returns to a vocational certificate increased slightly from 16 to 22 percent[28] (Grubb, 1996).

Earnings returns resulting from professional, industry, or vendor certification are difficult to quantify. We found no data on the earnings returns attributed solely to certification, although several IT vendors do collect data on the earnings of those workers certified by their companies. Microsoft, for example, reports that workers with certifications and an associate degree, high school diploma, or some postsecondary coursework earned close to $60,000 in 2000.

[28] It is important to note that these data only included those workers who obtained a vocational certificate (most likely from a community college or proprietary school). As this report describes, there are various types of certificate and license programs as well as a number of venues through which to receive these credentials. As a result, workers who took courses on their way to a professional certification or license generally are not included in these data.

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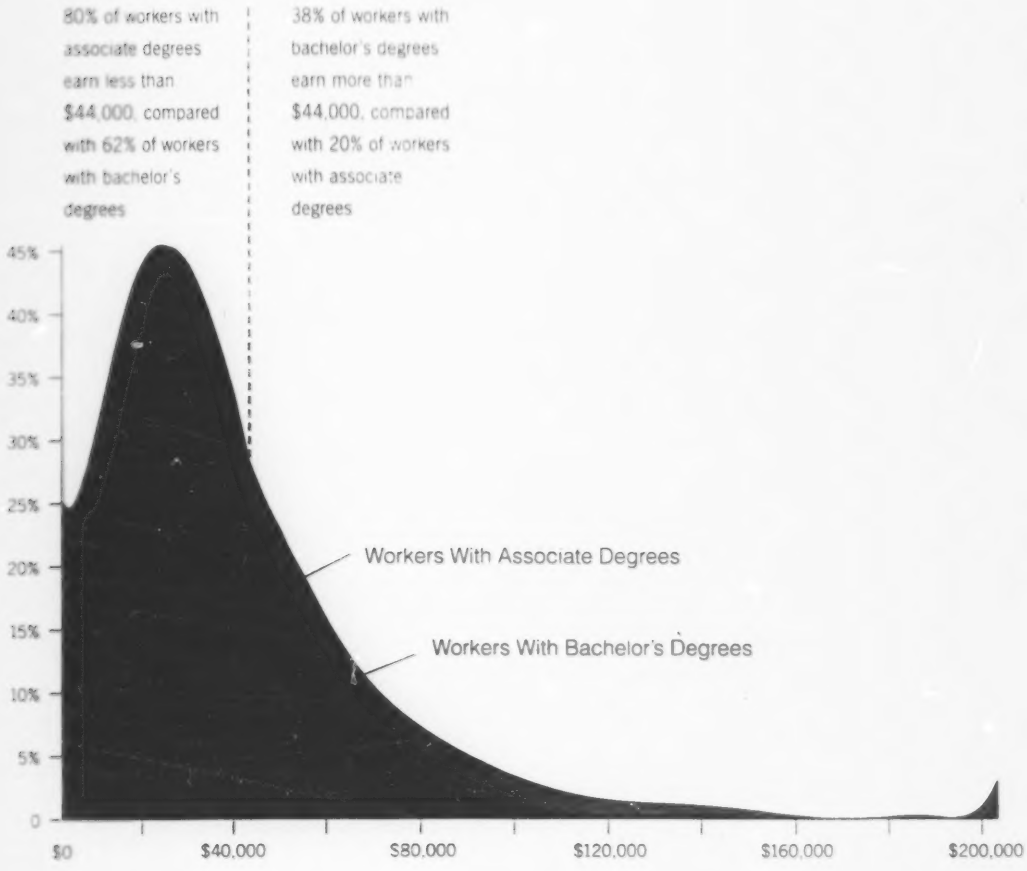
FIGURE 7

83% of Workers With Associate Degrees Earn the Same as Workers With Bachelor's Degrees

Share of workers, by education and 1997 earnings



Authors' analysis of Current Population Survey (March 1998).

However, 42 percent of all those who received certification reported no earnings increase as a result, while 32 percent received an earnings increase of more than 10 percent; about one-quarter reported an earnings increase of 10 percent or less (Briggs, 2000).

Obtaining a credential typically pays off for those who have some course hours invested. A year's worth of community college credits may boost earnings by

5 to 11 percent, but earning the credential provides additional returns (Grubb, 1999b). Meanwhile, the benefits of less than a year's worth of courses are generally zero or small enough to be insignificant (Grubb, 1999b). These findings seem to validate the concerns of many community college leaders about the subsequent earnings prospects of those students who only come to the college for a few courses and leave without a degree. However, we do not know the extent of the earnings effects upon those students who already have a job or degree and are in search of specific skills they need to advance in their current job. Furthermore, we are unable to separate out the subsequent earnings of those who learned enough to acquire a professional certification from those who simply dropped out.

In all community college degree and certificate programs, the earnings returns attributed to a degree or certificate depend greatly on the field of study. Women who complete a certificate in a business, health, or technical field may see earnings advantages that are 17 to 29 percent greater than the earnings of high school graduates. Among men, the benefits are fewer, but there is some evidence of positive returns to certificates in health (20 percent) (Grubb, 1996).

Findings seem to validate the concerns of many community college leaders about the subsequent earnings prospects of students who attend the college for only a few courses and leave without a degree.

The benefits of associate degrees also vary by field. For men, degrees in engineering/computers consistently provide positive returns, while business, math/science, public service, and vocational/technical sometimes show positive returns. As with certificates, women seeking degrees see the most consistent returns in business and health (Grubb, 1996).

In general, associate degrees in academic subjects do not produce the more consistent earnings returns of occupational programs, such as engineering/computers, business, and health. Given that occupational program completers are now just as likely to transfer as academic program completers, it appears that occupational degrees and certificates provide both increased earnings and pathways to bachelor's degrees. While bachelor's degree holders tend to have significant earnings returns regardless of their fields of study, those students who also specialized in more occupational fields, such as engineering/computers, business, and health, generally saw higher returns than those workers with degrees in education, social sciences, and humanities (Grubb, 1996).

In the debate between the education and training missions of the community college, the balance of the earnings data suggests those workers with associate or bachelor's degrees reap the greatest earnings returns. However, there are positive benefits to earning community college credits even without completing a degree. For many community college students, it is likely that a select number of courses provide just enough training to improve their skills, enabling them either to keep up with skill demands on the job, or move on to better employment opportunities.

PART 4: Credentialing Dynamics

Thus far, we have portrayed the range of academic and vocational offerings in community colleges as static alternatives along the education and training continuum. In fact, they are part of a highly interrelated dynamic that links skill change on the job with education and training in postsecondary institutions. Moreover, these dynamic relationships are governed by an equally dynamic and informal network of stakeholders.

Working to retool the community colleges' credentialing systems through the voluntary collaboration of stakeholders is a uniquely American response to changing skill requirements. It also is a crucial function of not-for-profit institutions in changing times. These voluntary efforts are a form of social capital unique to American labor markets in adapting to new education and training requirements. We are truly exceptional in our reliance on these informal mechanisms for adaptation.

Shaping International Credentialing Systems

As the globe spins into a new century, all advanced industrial nations are facing the same need to adapt their education and training systems to the relentless forces of global economic and technological change. But while the needs are the same, the differences in national cultures and the resulting structures of both labor markets and education and training systems are so stark that adaptation necessarily proceeds along different paths (Allmendinger, 1989; Esping-Andersen, 1993; Goodin et al., 1999).

For instance, in many European nations, the income and benefit guarantees of the European welfare states mute the effects of market forces on changes in content and credentials. In these systems, dense nationwide institutional networks jointly operated by governments, businesses, unions, and educators control changes in the credentials associated with education and training. Academic and occupational credentials are pervasive and carefully regulated. They also are the principal means of access

All industrialized nations will need to adapt to the relentless forces of global economic and technological change. But differences in national cultures —and the resulting structures of both labor markets and education and training systems— are so stark that the paths of adaptation will necessarily vary.

to employment opportunities in particular occupations. For instance, education and training credentials in Europe are a much more powerful predictor of occupational employment and lifetime earnings than in the United States (Shavit and Muller, 1998).

Proponents of the European model portray these formal institutional networks as important supportive social capital that promotes stability, fair sharing of the burdens of change, and more hands-on control of change processes (Streeck, 1992; Mishel and Schmitt, 1995). Proponents also argue that the welfare state provides a buffer between family income and skill changes, making workers more open to change and retraining because their jobs and earnings are already secure. They argue further that because this system is driven less by business needs and more by the social and economic needs of workers, it provides general education and vocational training, not just job-specific credentials.

In European nations, academic and occupational credentials are pervasive and carefully regulated. They also are the principal means of access to employment opportunities in particular occupations.

Ultimately, proponents believe that broader academic and vocational education and training ultimately serves longer-term economic needs. This provision of general skills, they point out, allows workers to more quickly adapt to fast-paced change in skill needs. Broader credentials make workers more autonomous on the job, increasing their value added in the flatter work structures of the new economy. More robust credentials also are touted for making workers better problem-solvers and team-members—skills critical to achieving new competitive demands for quality, variety, customization, customer orientation, and innovation. In addition, proponents of this model believe that sheltering the credentialing system from the narrow demands of job-specific skill changes gives educators and trainers the luxury of pursuing noneconomic cultural and educational goals.

Critics of the European model—and more and more of them are Europeans—find its arcane institutional networks and ubiquitous credentialing a barrier to flexible, fast response to economic and technological changes. From a purely economic point of view, they criticize the pervasiveness, breadth, and non-economic content in the European credentialing system for encouraging the misallocation of education and training resources and over-investment in education and training with little market value. Others decry the Europeans' careful credentialing system because it tends to track individuals from school

to work in ways that mimic and reproduce class and gender structures, and inhibit social and economic mobility.

In general, many critics argue that the rigidity of Europe's credentialing system, along with other aspects of the welfare state, discourages adaptation. For example, some believe the bureaucratic density of the welfare state, including the credentialing system, has slowed or failed to produce a shift from high-wage, high-skilled jobs in durable manufacturing to high-wage service occupations. According to this view, this has generally inhibited the development of services job opportunities, especially for European women.

American workers have always regarded "credentialism" as a barrier to opportunity, and have accepted "credentialing" grudgingly as skill requirements have grown.

The American model is decidedly different, largely because of our egalitarian bias against tracking students into particular occupations through a rigid system of education and training governed by well-articulated credentials. Americans support credentials as a form of consumer protection, and as a way to provide a labor market shelter for occupational or professional values. Sometimes, as in the case of unions, Americans support credentials that limit entry into an occupation as a way of protecting income levels in that occupation. But overall, "credentialism," like all other "isms" except "pragmatism," is a suspect idea in the United States.

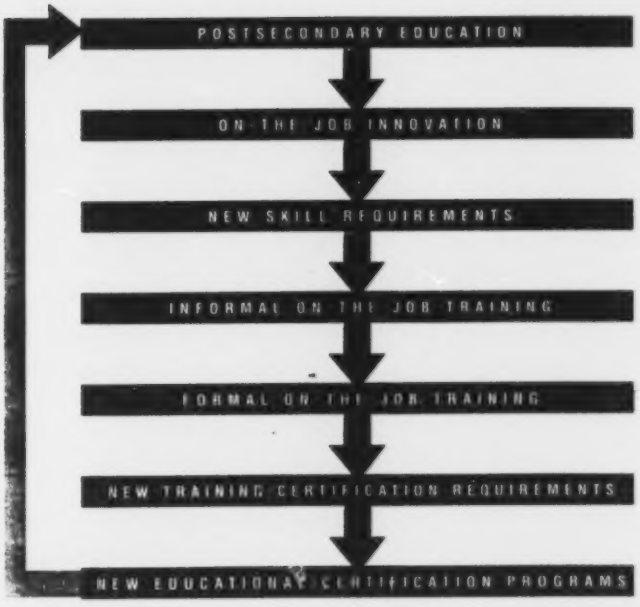
American workers have always regarded "credentialism" as a barrier to opportunity. This bias dates back to our nation's early history, as successive waves of immigrants came here to fill persistent labor shortages and to escape the class and religious prejudices of European guilds. America has accepted "credentialing" grudgingly as skill requirements have grown, especially since the beginning of the nineteenth century (Wiebe, 1995).

Now, as then, employers support credentials that stand for job-related skills guaranteeing performance. This explains employers' increasing preference for performance-based degrees and certifications as the share of the workforce with at least some college increases. Reliable work-based credentials help employers reduce search and other hiring costs. Reliable credentials also reduce on-the-job training costs, when new hires come "ready" for informal and formal employer training.

The Dynamic of Turning Work Processes into Certifications

The skill requirements that form the backbone of educational credentials and criterion-referenced certifications start in the workplace. Classrooms are not the breeding ground for innovation and new work processes. Instead, skill requirements are born on the shop floor, at the computer terminal, or in the hospital lab. Classroom learning is, however, an efficient method of disseminating new work processes to an increasing number of workers. And many of the increasing skill requirements adopted as workplace processes are eventually formalized into certified skills to be generalized across firms. Eventually, job-based skill changes may create whole new occupations and professions.

During periods of economic and technological turmoil in highly deregulated labor markets such as our own, education and training responses are diffuse and open-ended. When it works best, the relationship between skill change on the job and the credentialing process in the external education and training system is a busy two-way pipeline between school and work.



The flow of new skill requirements from the workplace to education and training institutions begins with incremental skill changes on the job that are learned informally—employers tend to take the available workers and turn them into the skilled workers they need. Sometimes specific incremental skill changes accumulate, becoming a critical mass of new skills that affect a sufficient number of employees. Interest in cost efficiency and consistent quality then give rise to more standardized formal training programs either "made" in-house or "bought" from training suppliers, including community colleges.

Once training becomes formal, a new issue arises: how to measure its quality and effectiveness. Some responses entail assessments of job per-

formance and/or the certification of the skills required to solve the performance problem. If the new skill requirements grow to a sufficient scale, they can become key elements for certified occupational preparation. In some cases, new skill requirements become so pervasive that they become part of the degree system of general education. At this point, employers can shift the training costs and responsibility into the mainstream system of academic and vocational preparation for work (Carnevale, Gainer, and Villet, 1990).

The evolution of IT from an informal skill to formal credentials is a case in point. When the computer first made its way into offices across America, workers learned to run the new technology via on-the-job training and other computer users. As computing evolved and personal computers became as common as pens, pencils, and typewriters on the desks of secretaries and other mainstream workers, companies began to provide computer training to their staffs. When technologies become standardized and more widespread, larger companies centralize their training through in-house training programs, while smaller companies tend to outsource their training to local providers, such as community colleges and for-profit learning institutions.

In some cases, new skill requirements—born on the shop floor, at the computer terminal, or in the hospital lab—become so pervasive that they become part of the degree system of general education. The evolution of IT from an informal skill to formal credentials is a case in point.

Some work processes evolve even further, becoming standardized across industries or occupations. For some skills, such as word processing, implementation is so widespread that after a sufficient period of integration, the learning process reverts back inside the company and is again taught "on-the-job" as new workers are hired or when technological advances prompt skill upgrades.

In skill areas that are standard yet measurably specialized, such as accounting, health care, or law, standardization allows outside institutions such as two- and four-year colleges, proprietary schools, or professional associations to impart certificates or degrees upon workers who meet course and/or examination requirements. In some instances, these new certifiable skills represent extensions or specialization of previous occupations—such as a registered nurse becoming certified as a pediatric nurse or an accountant becoming a Certified Public Accountant (CPA).

In other instances, emerging work processes create new credentialed skills altogether. After World War I, many returning men went to work in factories. As the assembly line became more advanced, the most skilled work was not working on the line, but coordinating the work between the lines. As technology became more advanced and the coordination became more complex, the most skilled workers rose through the ranks to become "manufacturing engineers." As manufacturing processes became more standardized, as well as specific to the manufacturing sector, the training moved to the university level. Today, most manufacturing engineers come from colleges and universities, not from the shop floor.

Once new general job-related skill requirements are introduced to the mainstream education system, they become part of the funded and degreed credentials that flow from educators to employers—part of the broad educational and occupational preparation that supports the transition from school to work.

Once new broadly based requirements for job-related learning become part of the mainstream education system, these more general skills become part of the publicly funded and degreed credentials that flow from educators to employers. This is all part of the broad educational and occupational preparation that supports the transition from school to work.

The Dynamic Trade-off between Education and Training

The value of a certified skill becomes more complex in a knowledge economy. As job growth and earnings returns demonstrate, preparing for the knowledge economy requires a constantly rising level of general skill; hence, the increasing share of workers with college degrees. But finding a specialized skill, often validated through some credentialing or certification mechanism, also can have a payoff. In general, the relationship between academic education and other forms of learning provided by community colleges is complementary, and career success depends on a complementary sequence of learning experiences.

The greatest career success goes to those who begin lifelong learning by achieving a threshold level of academic education that, in turn, provides access to either further academic preparation, occupational certification, or other forms of work-related learning (Heckman and Forum, 2000). The distinction between the new and old economy is that the threshold for initial academic education has risen from high school or less to high school plus at

least some college. At some point, every student has to put a vocational point on his or her academic pencil. A strong high school preparation can lead directly into vocational training in a community college or a four-year college major with a strong occupational focus, such as marketing or engineering. Community college students can transfer from academic programs to four-year colleges or to specialized vocational programs. To develop a career, those who graduate from four-year colleges can work in their major fields of study, go to graduate or professional schools, or pursue work -experience and employer-based training.

The workplace restructuring that began in the early 1980s prompted employers to demand more general skills that continue to be important today—including skills like problem solving, interpersonal and communication skills, creativity, and the ability to take responsibility.

The workplace restructuring that began in the early 1980s prompted employers to demand more general skills that continue to be important today (Cappelli et al., 1997). Unlike the old manufacturing-based economy where simple productivity—high volume at low cost—was paramount, the new high-tech manufacturing economy and growing services economy demand a more complex set of performance standards. These include quality, variety, customization, customer focus, speed of innovation, and the ability to add novelty and entertainment value to products and services. Employers who meet quality standards require conscientious workers who are able to take responsibility for the final product or service—regardless of their level in the company. Variety and customization require workers who are creative and problem-solvers. Focusing on customers requires empathy as well as good communication and interpersonal skills. Continuous innovation requires a general ability to learn. Adding novelty and entertainment value requires creativity.

Workers need better general and complex reasoning skills to make job-related decisions on their own and the technical skills to detect and fix problems. As flexible technology takes on more tasks, workers in all jobs—including technical and professional jobs—spend more time interacting with co-workers and customers. For example, the average worker at a computer help desk needs to know more than how to fix your computer problem; he or she must also be able to probe for the pertinent information about the problem, and then convey how to correct the problem. In addition, the increasing levels of human interaction in manufacturing and the expanding white-collar services occu-

pations demand that workers have "soft skills" or "people skills"—the ability to work as a team, with a total quality management circle, or to interact with customers, students, or patients (Cappelli et al., 1997; Bailey and Berryman, 1992; Carnevale, 1991). So while specific skills are becoming increasingly important, so are the general skills that enable the worker to function in a more global environment (Carnevale and Rose, 2000).

Little is known about how to develop and assess these general cognitive and behavioral skills in students and workers. Nonetheless, most employers associate them with educational attainment, especially at the college level. As a result, American employers use a college degree as the standard by which to screen job applicants.

Rising Skill Requirements: Some Evidence

The view that new competitive requirements have increased general cognitive, problem-solving, and interpersonal skills is advanced in a broad empirical and qualitative literature in industrial, human capital, and business research. In the 1970s, a body of literature on the shift to "flexible production" in manufacturing emerged within the industrial organization and human resource development fields. The literature acknowledged the need for workers with sufficient skills to work in team-based "high-performance work systems" (Piore and Sabel, 1984; Camp, 1989). Other literature on technology change in manufacturing emphasized the need for higher skills, as flexible technologies took over hands-on "transformation" and "transfer" functions, leaving workers with more highly skilled "control" functions in the use of technology to produce new kinds of value, especially product quality (Blackburn et al., 1985). A parallel shift occurred in the service sector during the 1980s, as the "high-performance work systems" framework spread into private services and rising skill requirements were associated with "reinventing" and "re-engineering" in health care, government, and the military as well (Office of Technology Assessment, 1990; Dertouzos, Lester, and Solow, 1989; Cyert and Mowery, 1987; Hirschhorn, 1988; Zuboff, 1988).

Human capital economists added more empirical weight to the literature on changing skill requirements by reporting the anomalous

finding that both absolute and relative earnings of college-educated workers were growing rapidly in spite of their increasing numbers. In addition, they found that among workers with the same college credentials, the highest earnings returns were going to those with the highest assessed skills (Levy and Murnane, 1992; Levy, 1998; Gottschalk and Smeeding, 1997; Danziger and Gottschalk, 1993). This stream of research ultimately led economists to conclude that employers were buying skills, not degrees, as a result of "skill-based technology change" in the new economy (Bound and Johnson, 1992; Katz and Murphy, 1992; Carnevale and Rose, 2000).

A parallel business dialogue emerged in the 1970s on the effects of changing technology and new high-performance work processes on skills. Business recognized that new competitive requirements resulted in new skill requirements. While productivity produced high volumes at low cost and was an important competitive standard between 1946 and 1973, new standards had arrived as part of the "competitiveness movement" in the early the 1970s. The competitiveness movement initially focused on quality. It was generally agreed that quality required higher levels of "hard" and "soft" skills (Grayson and O'Dell, 1988; Garvin, 1988).

In the 1980s, business leaders recognized that people needed problem-solving skills to provide added value through increased variety in production and the customization of services (Goldhar and Jelinek, 1983). In addition, a need for empathy and interpersonal skills emerged as customer service became an important competitive requirement (Zemke and Schaaf, 1989). At the same time, speed became widely recognized as a competitive asset that required both higher levels of soft and hard skills (Stalk, 1988; Hout and Stalk, 1990). In the 1990s, creativity and "valuing diversity" became widely recognized as competitive standards and new skill requirements (Carnevale and Stone, 1995; Jackson and Ruderman, 1995; Wolff, 1998).

Responding to the vibrant dialogue in the business and academic community on new skill requirements, educators renewed their focus on John Dewey's belief in constructivist learning and the view that some learning should be done in groups or through experiences outside the classroom (Bailey and Berryman, 1992; Marshall and Tucker, 1992).

While little is known about how to develop and assess general cognitive and behavioral skills in students and workers, most employers associate these skills with educational attainment. As a result, American employers use a college degree as the standard by which to screen job applicants.

Since workers with more academic education have greater access to occupational or professional training and formal and informal training on the job, educational credentials take on added importance. In general, only about 13 percent of high school-educated workers get formal skill-improvement training from their employers. In comparison, almost 20 percent of workers with associate degrees or some college receive formal employer-provided training, largely because they are concentrated in the training-intensive protective services and technical occupations with certification and licensure requirements. Workers with baccalaureate degrees receive slightly more training; 23 percent receive formal training on the job, because they tend to work in managerial and professional occupations that generally provide between 20 and 25 percent of their workers formal training (Eck, 1993).

In fact, training provided on the job is substantially different for various types of workers. Generally, only management receives broad developmental training. Even within management, however, it is the top executives who receive centralized, company-specific executive development training that prepares a limited number of workers to run the company. Mid-level management, supervisory, communications, and team training, using off-the-shelf training and development products, are more likely to be decentralized and provided through a human resources or training function of the company.

Professional and technical staff receive technical skill training generally developed by a senior member of the profession or trade, and administered in line with the agreed-upon standards in the profession. Of the formal training provided by companies, computer training accounts for nearly 20 percent of all training hours, and professional and technical training accounts for another 12 percent (Bureau of Labor Statistics, 1996). Customer-related training is provided to service workers, generally through on-the-job training or in short-term employer-provided classroom training. Those receiving this training usually work in sales and marketing, or as cashiers. Some companies also provide other assorted training, such as health training or basic skills training, but these types of training are not widespread.

The career and earnings advantages of the sequence of academic, occupational, and work-based learning accumulate rapidly. Those with at least some

education beyond high school—a year's worth of courses—can earn from 5 to 11 percent more than high school graduates. Access to a year of employer-based training can result in a similar increase in earnings, anywhere from 3 to 11 percent (Bishop, 1996). Higher levels of formal education not only increase access to jobs with training, they also increase access to technology that complements rather than replaces skills. Less educated workers tend to use technology that reduces the level of skill required—for instance, cash registers with pictures of foods on keyboards rather than numbers. The technology, however, makes those workers more productive. More highly educated workers use technologies that increase worker autonomy and complement skill—for instance, desktop computers and flexible machine tools.[29]

The career and earnings advantages of the sequence of academic, occupational, and work-based learning accumulate rapidly.

When technology complements the skills employees bring to the job, it increases the value they can add to the work in the forms of greater efficiency, quality, variety, customization, convenience, and speed. However, when jobs are designed to substitute information technology for worker skills, the worker's ability to add value is reduced. It is for this reason that the earnings premium for using information technology on the job increases with education level. For instance, high school dropouts who use computer information technology on the job experience a 15 percent increase in pay over high school dropouts who do not use information technology on the job. The earnings premium for college graduates, however, is nearly twice as high (Mishel and Bernstein, 1995; Krueger, 1993).

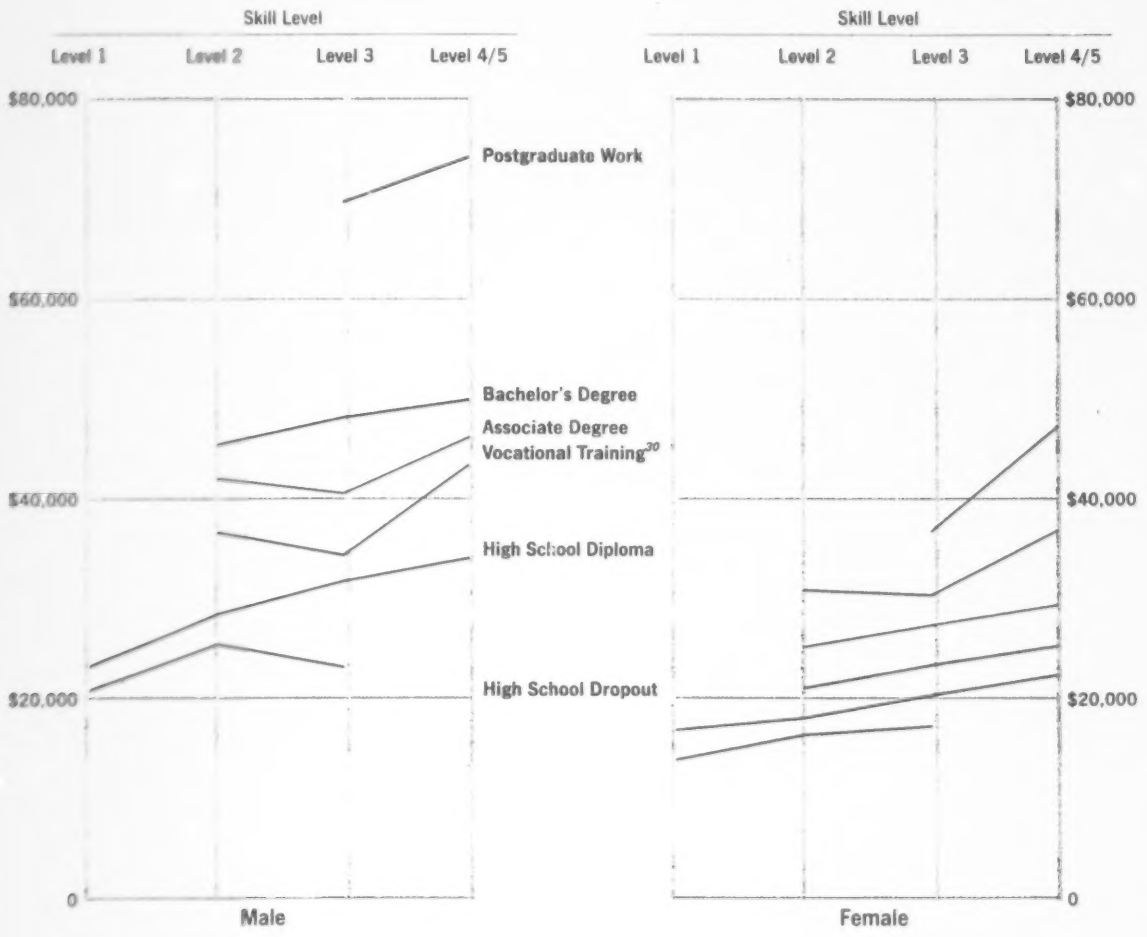
Credentialed learning and more informal and narrow occupational and employer-based training are substitutes as well as complements in their effect on earnings. Often, postsecondary education and training indirectly helps applicants gain access to many types of entry-level jobs, because it signals to employers that applicants will benefit from further on-the-job training. In these cases, general education or training credentials substitute for a more stringent analysis of potential employees in employer-hiring practices and for job-specific training. Available evidence suggests that employers are correct in their judgment that general education signals trainability. Studies of worker productivity have consistently found that people with postsecondary education, even those not working in their fields, have acquired general skills that make them more productive than workers in the same job who have less education.

[29] The relationship between technology and skills is complex. In every occupation, new technology substitutes for some skills and requires new skills. For instance, calculators and computers substitute for hands-on skills but leverage high-order thinking skills in exploiting computer power to enhance performance. In industries and occupations where performance standards also demand quality, variety, customization, convenience, speed, and innovation at least cost, flexible technologies tend to complement and leverage higher-order skills. When job designs use technology to substitute for skill, the result is higher productivity but also low-wage, low-skilled jobs, especially in the low-wage service industries and in mass production of standardized goods.

FIGURE 8

Both Educational Credentials and Skill Levels Affect Earnings

Average annual earnings of year-round workers age 16-64 in 1998 dollars



Authors' analysis of National Adult Literacy Survey, 1992. Data converted to 1998$ using the CPI-U. Missing graph segments are ones in which sample size is too small to provide a reliable estimate.

Conversely, while the most powerful wage premiums accrue to workers who can use training on the job to complement pre-employment educational and occupational preparation, employer-provided training can substitute for educational preparation that is lacking. Informal on-the-job training is the largest

[20] Vocational training also includes trade and business schools.

source of training for those who do not go beyond high school (Eck, 1993). In fact, although few workers without high school diplomas receive formal training from their employers, those who do get such training earn more than high school graduates who do not receive employer training (Eck, 1993). While employer training increases earnings most for the most educated workers, employer training, especially formal training, increases earnings for workers at every education level, compared with similarly educated workers who have not been trained by their employers.

Ultimately, successful careers are best guaranteed by degree education beyond high school and long-term access to general and job-specific learning.

Although employer-based training or more narrow vocational credentials and certifications can substitute for general educational preparation in a particular job, they are less durable than the combination of broader educational and occupational preparation. Much the same is true for job-specific vocational preparation in schools, especially in high schools. Ultimately, successful careers are best guaranteed by degree education beyond high school and long-term access to general and job-specific learning for sustained career adaptation.

In addition to the complementary relationship between education and training, there is another kind of credentialing dynamic: the complementarity and substitution effects between education and skill. In some cases, high levels of general skill can substitute for lower levels of education. By examining the earnings of workers with different education and skill levels, we can measure those effects *(see Figure 8, facing page).*[31] The labor market clearly recognizes the value of skill above and beyond workers' educational credentials just as it rewards workers for pursuing additional education.[32] The reverse also is true. Additional education can offset low levels of general skill. Clearly, however, when education and skill are complementary, the highest earnings result. Those with the most education and training *and* the highest levels of skill are also the economy's highest-paid workers.

[31] There are many different kinds of skills used on the job, including occupational skills, academic skills, and "soft" skills used in workplace communication and interaction. In the context of this analysis, "skill" includes only the prose, document, and quantitative skills that serve as a foundation for processing information in work and home situations.

[32] After accounting for differences in workers' characteristics and education, estimates suggest that an additional "level" of skill, measured by the National Adult Literacy Survey, raises workers earnings by 12 to 17 percent (Sum, 1999; Raudenbush and Kasim, 1998; Carnevale, Fry, and Rose, forthcoming; Carnevale and Desrochers, forthcoming).

PART 5: The Evolution and Changing Context of the Community College

Community colleges cut their eyeteeth on change—for nearly a century, they have sharpened a unique ability to respond to the evolving education and training needs of students, communities, and employers. The new forces at work inside and outside American education represent more than the latest test of agility for community colleges—they also represent new choices and opportunities for credentialing. While no one can predict the future, economic and demographic realities in place suggest the shape of things to come. The economic reality is that access to postsecondary education has become the threshold for individual economic success. People aren't going anywhere in the new economy unless they have credentials. In the new knowledge economy, the ability to produce and distribute credentialed learning will contribute to America's overall level of competitiveness and its ability to continually adapt to changing skill requirements in the workplace.

The complexity, variety, and importance of postsecondary credentials have grown substantially, especially since the 1980s, because the ties between postsecondary institutions and the world of work have grown in the knowledge economy.

The Rise of the Comprehensive Community College

The complexity, variety, and importance of postsecondary credentials have grown substantially, especially since the 1980s, because the ties between postsecondary institutions and the world of work have grown in the knowledge economy. Access to postsecondary education has become the ante for individual career success and the modal requirement for a globally competitive national workforce. As a result, it is not surprising that the economic functions of postsecondary institutions are becoming more comprehensive. These forces are giving rise to the comprehensive university and the comprehensive community college: As higher education evolves, it increasingly emphasizes the utilitarian economic value of credentialed and noncredentialed knowledge and skill.

Community colleges and universities steadily expand their roles in different ways. The comprehensive university has expanded its economic role principally through R&D. In contrast, as their core education and

training functions expand and diversify, economic missions of community colleges proliferate.

The core function in community colleges always has been teaching and learning. Since their inception in the early twentieth century, community colleges have focused on expanding academic opportunities. Academic preparation still is the core function of community colleges in the status hierarchy of faculty and students. Nevertheless, the community college has gradually moved toward vocational education, job training, and community service programs—which has resulted in a progressively more comprehensive education and training mission (Adelman, 1998; Jacobs, 2000; Brint and Karabel, 1989).

Academic preparation is still the core function of community colleges—but a gradual move toward vocational education, job training, and community service programs has resulted in a progressively more comprehensive education and training mission.

Steady growth in vocational education and training functions since World War II indicates the community colleges' versatile and dynamic response to social forces.

- **Postwar:** Prior to the postwar boom, community colleges provided vocational training in teaching, bookkeeping, and clerical functions. With the advance of industrialism, community colleges began to provide more vocational training in craft and skilled blue-collar occupations.

- **1960s:** The increase in industrial vocations accelerated. New vocational programs emerged in health care, computer training, and in protective and environmental services. The idealism of the 1960s expanded the community college commitment to upward mobility and strengthened the role of core academic programs.

- **1970s:** With the "baby bust," the 18- to 24-year-old student population declined and local economies became increasingly unstable, which encouraged a shift toward remedial education, youth training, adult education, and workforce development. Hard times and the intense competitiveness beginning in the late 1970s shifted broad-based vocational preparation from employers to postsecondary institutions (with some exceptions, such as apprenticeship programs in heavily unionized industries like construction and the

maritime trades). Community colleges added nondegreed, certificate, and noncredit job-specific training.

- **1980s:** After the recession in the early 1980s, the massive restructuring of the economy dramatically increased the value of all forms of postsecondary education and training relative to high school diplomas. As a result, more people wanted to prepare academically for transfer to four-year colleges; "second chance" and remedial programs for those who did not achieve basic skills at the high school level proliferated. At the same time, the demand for vocational preparation, workforce development, and contract training expanded and became part of a growing economic development function that served a broad range of small service and manufacturing businesses.

Community colleges have become more entrepreneurial and open to the changing social and economic needs of local communities and employers, drawing more nontraditional students and becoming more diverse in both their teaching functions and their student bodies than four-year colleges and universities.

As commitments between employers and employees declined and the intensity of competition increased, employers began to rely more on community colleges for credentialing new hires and training incumbent workers. Meanwhile, the real value of public institutional aid to higher education and financial aid to students has been declining since the 1970s, especially for academic programs (McPherson and Shapiro, 1997; Gladieux and Hauptman, 1995). This decline has encouraged community colleges to seek new revenue sources, such as publicly and privately funded job training, noncredit contract training, and vendor certification.

As a result, community colleges have become more entrepreneurial and more open to the changing social and economic needs of local communities and employers, drawing more nontraditional students, including adults with family and work responsibilities, dislocated workers, and the educationally disadvantaged. Because of their status as "people's colleges," they tend to attract a greater share of low-income and minority students. For this reason, community colleges tend to be more diverse in both their teaching functions and their student bodies than four-year colleges and universities.

Managing diversity is an important aspect of the constant debate over the missions of community colleges. One set of protagonists in that debate decries the expansion of both remediation and various forms of training as a two-

pronged assault on the community colleges' core academic missions: preparing students for transfer to four-year colleges. Others see the expansion of vocational functions as beneficial to opportunity and school-to-work transition for both traditional and nontraditional students (Jacobs, 2000).

Community Colleges and Equity

In its distilled form, the debate over the multiplying missions of the community college is a collision between the community colleges' commitment to equity and its more utilitarian economic functions (Brint and Karabel, 1989; Dougherty, 1994). Increasingly, the extent to which a U.S. worker succeeds in obtaining good pay and benefits is linked to college-level educational attainment and achievement. And as the education and training requirements in the new economy escalate from high school to college, the community colleges' effect on economic and social opportunity is hotly debated.

Community college educators come by their commitment to equity honestly. Education has always played a key role in promoting equality of opportunity in the United States. In fact, we have charged our educational system with the enormous responsibility of enabling upward mobility, and the United States has relied heavily on investments in education to equalize opportunity. By way of contrast, Europeans have invested in income, health care, housing guarantees, and other public services to equalize outcomes (Lipset, 1997).

Equity concerns in postsecondary education stem from the increasing differentiation in opportunity within that community. The American higher education system is increasingly hierarchical in the selectivity of its admissions (Hoxby, 1997). Students who go to more selective institutions complete more years of postsecondary education and accrue more credentials, compounding the differences in human capital investments compared with those who go to less selective institutions (Tinto, 1993; Carnevale, 1999).

Within community colleges, equity concerns are deeply rooted in the shift from a primarily academic mission toward one that is increasingly

(continued on next page)

vocational. By providing a vocational education, community colleges prepare many students for mid-level jobs, and in the process, divert them from a broader academic education that enables them to pursue additional schooling and elite jobs. The other side of the coin is that community colleges' unique "open door" admissions, and their mix of vocational and academic education, provide greater access to postsecondary schooling to students who otherwise would have terminated their education and training at the high school level (Brint and Karabel, 1989; Dougherty, 1994).

In fact, among similarly qualified high school graduates, the likelihood of achieving a bachelor's degree is about 15 percent lower for those who start out at two-year colleges than for those who start out at four-year colleges (Dougherty, 1994; Pascarella, 1999). However, the accessibility of community colleges marginally offsets this difference in attainment. When students at two-year colleges are compared with similar students at four-year colleges, access to two-year colleges increased overall years of postsecondary education (Rouse, 1995).

A variety of strategies can be employed to further increase educational opportunity at two-year colleges. Incremental changes can be made by familiarizing students and faculty at both two- and four-year colleges with one another's standards and culture. Additional modifications include mixing venues for two-year and four-year faculty, and mixing course offerings—giving two-year students access to four-year courses and giving four-year students access to vocational courses, certificates, and standards-based certifications available at community colleges. Transitions also could be made piecemeal by turning noteworthy two-year programs into baccalaureate degree programs. Alternatively, more community colleges could become branch campuses or closely tied affiliates of four-year institutions. More pervasive changes could result by turning some two-year colleges into four-year colleges (Walker and Zeiss, 2001).

Short of these institutional changes, authorities can attack attrition, transition, and persistence problems. Dormitories for residential programs, jobs on campus, and common scheduling for cohorts of students in similar academic and vocational programs would foster peer support and group identity. For their part, four-year colleges can

facilitate transfers by setting aside for transfer students a portion of financial aid, housing, and on-campus jobs—currently, these are targeted toward incoming freshmen (Dougherty, 1994). To encourage transitions among two-year vocational students, four-year colleges can also set standards for accepting technical credits and establish "capstone" courses covering general education credits necessary for graduation.

Community colleges are alternately portrayed as the hero or the villain in the debate over equity in postsecondary education and training. In general, their net effect is to increase both general access to postsecondary education and training at the sub-baccalaureate and baccalaureate levels. Thus, while community colleges may divert some students from their initial goals, their net effect is to democratize access to college (Rouse, 1995).

Economic and Demographic Momentum

One thing is certain: Community colleges can expect additional metamorphoses. Demographic momentum and economic changes now under way will ensure a surge in students as well as a surge in noncollege youth condemned to low wages unless they receive a second chance at some form of postsecondary education or training. By 2015, the traditional college-age population of 18- to 24-year-olds will increase by more than 4 million. This means that over the next 10 years, higher education will face a major expansion in demand for seats—perhaps as many as 1.6 million more college students, if participation rates in college continue. If 1.6 million students go on to college by 2015, the number of youth not enrolled in college will grow to at least 2.4 million 18- to 24-year-olds by 2015 (Carnevale and Fry, 2001). As in the 1970s, a surge in noncollege youth could bring youth employment policies to the forefront, presenting community colleges with new challenges for their missions.

One thing is certain: Community colleges can expect additional metamorphoses.

Much of the four-million-plus expansion by 2015 in the traditional college-age population will be minority youth. While White youth are projected to remain the majority, growing by 800,000 or 4 percent, minority 18- to 24-year-olds are expected grow by 3.5 million, or 40 percent (Carnevale and Fry,

2001). About half the coming boom in the 18- to 24-year-old population will be Hispanic youth. Whether the boom in college enrollments actually materializes in the next decade will largely depend on our success in fully integrating the nation's Hispanic youth into the ranks of high school graduates and higher education enrollees.

The Credentialing Cost Crunch

Demographic momentum, combined with economic realities, seems destined to create a set of mutually reinforcing trends that will ensure high demand for community college education and training over the next 15 years. But celebrations are premature. In general, the increase in the numbers of students, combined with resource constraints, could overwhelm current higher education capacity and resources. At the current expenditure rates and the current college participation rate, the added cost in higher education could be $20 billion by 2015 (Carnevale and Fry, 2001).

Demographic momentum, combined with economic realities, will ensure high demand for community college education and training over the next 15 years—but the soaring number of students, combined with resource constraints, could overwhelm current capacity and resources.

Competition for resources throughout the pre-K-16 education pipeline may well strain all available resources. The system of formal education is growing at both ends of the education and training continuum. As child care needs continue to grow, there is more of a push toward implementing universal preschool. The cost of developing such a large network of pre-kindergarten systems is estimated at $40 billion (The Century Foundation, 2000). In K-12 education, meeting new standards and hiring new teachers to reduce class size and replacing retiring teachers will cost more money.

At the other end of the continuum is employer training. As workers need better skills, employers will be required to provide just-in-time training to meet their production schedule. The highest-skilled workers are the most likely to receive this training. By 2005, these training needs may cost employers more than $95 billion in today's dollars, an increase of more than 20 percent (Carnevale and Desrochers, 1997). This is likely to increase the pressure on postsecondary institutions to produce education and training more efficiently. Aside from precursory cost-cutting measures, these institutions will be expected to demonstrate acceptable performance outcomes resulting from their expenditures.

These funding constraints, as well as the overall surge in college-age students, may inhibit our ability to capitalize on the demographic momentum among 18- to 24-year-olds. It is doubtful that a "reengineering" of a community college education in order to serve more students at lower cost will suffice. Even if it could, it isn't likely to come in time to serve the flood of new students that began arriving on college campuses in 1997. Nor is it likely that technology will save us by creating less expensive "virtual community colleges" for new students.

Technology investments could improve both quality and access to two-year and four-year colleges, especially for nontraditional students who require flexibility in program offerings. In general, however, experience with technology in higher education and other services sectors thus far shows that technology adds value more than it reduces cost (Ehrenberg, 2000). Technology can reduce costs eventually, but initial investments are expensive. And the most powerful long-term effects of technology appear to be new kinds of added value in the form of quality, variety, customization, convenience, speed, and novelty (Carnevale and Rose, 2000).

In addition to the added costs that may result from the rush of new students and the investments necessary to tap the potential value added from new technology, it is becoming increasingly apparent that community colleges need to invest more in teaching and learning. Investments are needed for community colleges to develop curricula and teaching capabilities customized for academic preparation, vocational education, remediation, the various forms of certifications, and job-specific training (Grubb, 1999a).

In addition to the added costs that may result from the rush of new students—and new technology—community colleges need to invest more in teaching and learning.

In the competition for scarce public resources, higher education may be a victim of its own successes and structure. Relative to other skill providers, particularly elementary and secondary education, higher education is viewed as more successful, entrepreneurial, and less in need of help. Therefore, policymakers and others may view it as less in need of additional resources.

Like other businesses, higher education is a market-based system responsive to market changes. This response, especially among community colleges, is one of the system's greatest strengths. But if public budgets do not fully fund

the surge of new students, higher education's vaunted responsiveness could become a classic case of market failure. Increased demand will increase costs. If public subsidies do not cover those costs, tuition will have to increase commensurately, which may discourage enrollments. Moreover, tight budgets will discourage maintenance of quality improvements already in place, possibly delaying new investments in educational quality.

With funding pressures on the horizon, community colleges may be forced to fall back on their entrepreneurial flexibility. If so, they need to be agile to keep up with incremental skill change in the economy. Both the pace of skill change and a more fluid labor market require reliable performance-based credentials validated in smaller increments than is customary in academic programs.

If public budgets do not fully fund the surge of new students, higher education's vaunted responsiveness could become a classic case of market failure.

The Spreading Demand for Performance-Based Credentialing

When viewed as a basic economic resource, human capital inevitably gets priced more for its extrinsic value than its intrinsic value. As higher costs for pre-K-16 education and lifelong learning become more unavoidable for families, governments, and businesses, all will want their education and training to come measurably cheaper, faster, and better. The public is likely to respond to arguments that performance-based reforms can deliver higher education just this way. Performance-based outcome standards are likely to become more prominent, influencing even the distribution of institutional and individual financial aid. This will put pressure on programs using time-based standards for degree requirements.

In fact, the introduction of performance standards, and their alignment with assessments, curricula, and teacher preparation is already well under way in elementary and secondary education. Performance standards have grown steadily for vocationally oriented proprietary schools and community colleges, and are poised to spread into four-year colleges and graduate academic and professional programs. As performance-based standards evolve in community colleges, we need to ensure that those standards balance the academic and vocational needs of all students.

The Need for Performance-Based Accreditation

In an effort to assess the value of education provided by each school, the accreditation criterion remains primarily measures inputs or resources, relying on indicators such as library collections, faculty/student ratios, and faculty research. But because many workers are looking for smaller bites of education and training, these foundations upon which accreditation is based may not support the changes occurring in postsecondary education (Glidden, 1998; Ewell, 1998).

With funding pressures on the horizon, community colleges may be forced to fall back on their entrepreneurial flexibility—and in a "performance matters" era, that means becoming more performance-based.

Accreditation historically has been a comprehensive input-based peer review of colleges and universities. While certification programs are already performance-based, in a "performance matters" era higher education is being challenged also to become more performance-based. After all, labor market outcome standards imposed by the federal Workforce Investment Act are creating new performance measurement systems in community colleges and proprietary schools. But these performance measures focus more on employment outcomes than on educational outcomes. In an education institution, it is more difficult to rest solely on performance measures as a gauge for institutional success. After all, education institutions work to improve the intellect and citizenry of their students, not just get them jobs. By measuring inputs and output, rather than just inputs, colleges will have more information to use in implementing programs and instructional methods and will be better able to gauge their progress in meeting their end goals.

PART 6: Issues Facing Community Colleges

Community colleges and their multi-functional roles will face significant demographic and financial challenges over the next decade and beyond. As increasing numbers of students come looking for postsecondary education during times when state and local governments are less likely to allocate additional resources, community colleges will be pressed financially. Externally, if their content offerings are not as deep as they are broad, community colleges trying to serve their constituents with limited resources will encounter increasing competitive pressure from alternative providers. Internally, tight budgets mean that community colleges will need to better coordinate their multiple program offerings to get the most bang for their buck. Aligning their internal and external needs and responses will become increasingly complex and important.

In responding to competitive pressures, some community colleges may emphasize their traditional transfer functions and perhaps even begin to offer bachelor's degrees. Others may focus on the demand for short-term training. But most will probably try to retain their comprehensive missions.

Though they have admirably worked to be comprehensive institutions, providing all things to all people in a competitive landscape, community colleges are experiencing a collective identity crisis. In deciding how to respond to the new competitive pressures they face, community colleges should recognize that they *do* have choices. Some colleges may choose to emphasize their traditional transfer functions, and perhaps even begin to offer baccalaureate degrees themselves. Other colleges may decide to focus on feeding the increasing demand for short-term training by courting returning students and securing corporate training contracts, putting them in direct competition with other for-profit providers. Most, however, will probably try to retain their comprehensive missions, continuing to seek a balance between their education and training functions in a way that maximizes college opportunities for both traditional and nontraditional students.

Fostering Institutional Change

Clearly, the winners in the fight of education versus training are those who recognize that both are required in today's workplace. The new knowledge economy clearly has upped the ante on the value of general knowledge in the workplace. But at the same time, increased emphasis on lifelong learning and performance standards has placed additional

importance on measured skill. Colleges can function most effectively by supporting strong linkages between the programs that develop these types of skills. With program offerings at community colleges typically entrenched within their mission-related objectives—administering occupational programs, academic programs, contract training, or continuing education programs—it is easy to operate with a myopic focus. As in all large institutions, programs often become entrenched in their respective "silos," operating in isolation and expending only minimal effort to interact with other programs.

For community colleges to continue their multiple missions, the internal "silos of learning" must be connected (Alfred and Carter, 2000). For example, because staff in the contract training programs are training local workers, they are often in the best position to know what kinds of skills are in demand. By sharing this information with the occupational programs, they get the edge in developing new certificate programs or refining their existing programs to balance professional skill requirements with local skill demands. In turn, contract training programs can serve as feeders to broader occupational certificate programs, which, when linked to external certifications, become even more valuable.

Academic programs and occupational programs also are complementary and can work to strengthen one another. Linking applied-skill certificates to academic offerings can better prepare students for work, after achieving either a terminal associate or bachelor's degree. In vocational degree and certificate programs, implementing a specialized academic course tailored to the vocational specialty can provide necessary academic knowledge without impinging upon the specialized nature of the certificate program.

Clearly, the winners in the fight of education versus training will be those who recognize that both are required in today's workplace.

The most significant barriers to institutional change are tensions that come embedded in that change (Alfred and Carter, 2000). Faculty and staff often become embroiled in either/or scenarios where "either we are educators or we are trainers," "either we are comprehensive institutions or we are exclusionary," or "either we offer traditional courses or we offer the latest fad in training."

The primary challenge for community college managers is to maintain coherence while promoting synergy across their rapidly changing education and training functions. The temptation to force "cross-functional" teams to "break

down the silos" to institute across-the-board program standards can be overwhelming for managers trying to get some measure of control (Goold and Campbell, 1998).

The secondary challenge is to proceed cautiously. Education and training functions in comprehensive community colleges emphasize different cultural values, and represent different customer requirements and pedagogy. The first step toward promoting fellowship among these functions is to map commonalities and differences. Next, colleges must match resources, performance standards, compensation systems, and institutional structures to minimize differences. Through capitalizing on commonalities, additional synergies can result.

Managing Program Transformations

Some of the most vital issues facing community colleges with respect to certification and credentialing revolve around program choices. To succeed in connecting their multiple missions, institutions may need to make program adjustments.

Some of the most vital issues facing community colleges with respect to certification and credentialing revolve around program choices. Institutions that are successful in connecting their multiple missions will likely need to make program adjustments.

The rising momentum toward outcome measures may well prompt a more uniform agreement across disciplines on certificate program guidelines. The hours of course time required to get a certificate vary by school and by programs within schools. Community college programs can range from less-than-one-year certificates to two-year certificates or more. Where there are external certification bodies, some certificate programs are designed so that graduates meet the required number of hours to obtain a professional certification, state certification, or license. While standardization is tempting—because it seems fair—each discipline is different and should be allowed the leeway to determine what body of knowledge is sufficient for a certificate. At the same time, however, certificates in similar disciplines offered by different institutions should not be so different in content that the value of one school's certificate is undermined by a less rigorous program at another.

Many community colleges view their certificate programs as a recruitment tool in the hope that students will use the certificate as a springboard into associate degree programs. Many students do. But with others looking only for

short modules of learning, an obvious concern is that certificate programs effectively "cannibalize" degree programs. This fear may be justified: There is less incentive for students to begin a terminal degree program it a certificate will give them just enough skill to get the job.

As colleges develop compatible certificate and degree programs to provide students with an educational ladder, certificate students who continue on to receive a degree may receive two credentials by "double-counting" some coursework, while initial degree-seeking students receive only one credential for the same coursework. When the certificate and degree programs are noncompeting, as in the case of radiology technician certificates and nursing degree programs, this is less of an issue. But colleges offering both certificates and degree programs in fields such as accounting or early childhood education will need to reevaluate the "mission" of each program.

This so-called cannibalization of degree programs also is a concern among those institutions offering post-baccalaureate certificates (Patterson, 1999a; Patterson, 1999b). As a result, some higher education institutions have opted not to offer stand-alone certificate programs in fields where they offer degree programs. By offering free-standing programs, colleges can avoid diverting prospective degree-seeking students, but at the same time gauge the demand for a possible degree program in a particular field. In other cases, certificate programs are designed as "add-ons" so they do not take away from a post-baccalaureate or post-master's degree. Instead, the add-on lets students focus on a specialty or broaden their more narrow degree studies. Some post-baccalaureate students have found that adding on a certificate program has made them more marketable in the workplace (Patterson, 1999b; Welch and Syverson, 1997).

In some fields—such as accounting or early childhood education—colleges' certificate and degree programs may compete with each other, and the "mission" of each program will need to be reevaluated.

Another way to avoid the cannibalization of degree programs is to offer certificate programs in interdisciplinary studies, drawing from many parts of the institution instead of one particular vocation or academic specialty (Walker, 1999). Some community colleges have implemented interdisciplinary certificates. For example, the Fashion Institute of Technology offers its fashion design students certificates focusing on Internet-related marketing and e-business (Becker and Barnett, 2000). Evidence suggests, however, that

because of careful management of certification options, cannibalization of degree programs has not been a significant problem at the post-baccalaureate level (Patterson, 1999b).

Aligning Curricula to External Standards

The alignment of program content with external industry standards presents another set of managerial complexities. Aligning curricula with the external environment requires careful customization to reflect local industry and community needs. At the same time, local businesses are increasingly driven to meet regional national or global skill standards.

Community colleges have powerful incentives to customize their occupational curriculum to industries in their region—and competing incentives to bow to global standards in response to the globalization of economic competition.

It is generally assumed that globalization and new technology allow companies to locate wherever it is most cost-effective. In fact, while companies increasingly compete regionally, nationally, or globally, they tend to be organized locally into clusters of interconnected competitive networks. For example, furniture companies are attracted to North Carolina and bio-technology companies are attracted to Boston because there are suppliers, necessary technologies, university research and development, and a workforce customized to meet the needs of the competitive cluster (Porter, 1998; Kanter, 1997). Because industries tend to cluster in particular geographic areas, most labor markets and employers for which community colleges prepare their students are local. As a result, community colleges have powerful incentives to customize occupational curriculum to particular industries or industry clusters.

However, the globalization of economic competition, while not resulting in greater mobility among workers, has driven skill requirements toward global standards. So while employers may produce locally, they increasingly compete on the basis of global standards. But as certification standards inch toward a uniform global template, the actual structure of certification and licensing remains tied to state and local governments, and national professional, industry, and occupational associations.

Additional complexities in meeting external skill requirements arise because the skill standards in an occupation can vary depending on the industry, even when the industries seem quite similar. For example, companies building

small airplanes in the Wichita area require program curricula and standards that differ from those required by the cluster of large airline companies located in the Seattle area.

Aligning community college certificate and degree programs with external standards can be difficult when trying to balance local and national skill requirements. Although community colleges need to ensure that their programs meet local needs, they also should seek to align their curricula with professional, trade, or industry standards when they exist. Programs that prepare students for national certification exams give them access to an additional credential and provide community colleges with a convenient measure against which to benchmark their programs.

Additional complexities in meeting external skill requirements arise because the skill standards in an occupation can vary across related industries. For example, airline companies may require different program curricula and standards depending on whether their product is large or small aircraft.

The complexities that arise when trying to meet local, national, and rapidly changing skill requirements suggest why efforts to implement a national "skill standards" program may prove difficult. Even though a "skill standards" initiative may work in an established and relatively stable field like health care or accounting, applying national skill standards to a dynamic system like IT is likely to fail because technology is changing too rapidly. For instance, although Microsoft certifications emerged less than a decade ago, the company has already retired or replaced 27 of its certification examinations (Adelman, 2000).

In part, aligning program content standards to external standards has become a heightened issue at community colleges because of the rise of vendor certifications. When companies offer training for vendor certifications, the company—not the educator—dictates the course and exam content. When a company produces a product, as well as the associated training materials and certification exam, it has almost unlimited discretion. It can, for instance, decide what certifications will be offered and what the course and exam content will contain. The company is only bound by development and dissemination time.

For-profit institutions—trainers and vendors alike—have an advantage in that they can quickly change their course offerings to stay abreast of economic and occupational trends. In contrast, community colleges face a daunting prospect: Curriculum changes usually must be approved by a curriculum committee that

convenes anywhere from once a month to once a year. For this reason, although community colleges generally can react to changing industry demands faster than four-year colleges can, they often react slower than for-profit institutions (Lerman, Riegg, and Salzman, 2000). For instance, the for-profit DeVry Institutes invest heavily in market research, and its degree offerings are based on market demands, not collegiate political wrangling (Ruch, 1999).

If community colleges want to compete with other credential providers, they will need to ensure that their curriculum development procedures allow them to keep pace with industry changes, both nationally and locally. Many programs already have local industry involvement, but others could establish stronger ties. Also, more interactions with community college contract training instructors who know what customized training skills employers are requesting is crucial.

More than $720 billion is spent on education and training each year. The sheer size of the market is attracting a wider set of providers, seen in the increase in vendor certifications, distance and Internet-based learning, and test-preparation companies.

Competing with External Providers

Providing credentialed skills—from incremental, bite-size lumps to full academic programs—is already big business, especially in specialized niches or boutique markets too small to justify more complex education programs and overhead. More than $720 billion is spent on education and training each year. The sheer size of the market is attracting a wider set of diverse providers, as evidenced by the increase in vendor certifications, distance and Internet-based learning, and test-preparation companies. Competition for shares of the training market exists, for the most part, among educators—this includes the not-for-profit two-year and four-year institutions, and the for-profit proprietary schools. And, apart from employer-provided training and proprietary school training, the bulk of the $720 billion spent stays in the public education system (Carnevale and Desrochers, 1997).

Public institutions, such as community colleges, hold an advantage over proprietary schools because they receive significant legislative subsidies to build classrooms and purchase equipment. Proprietary schools must finance these expenses either through tuition or by raising external capital investments. Because proprietary schools do not have the luxury of relying on public subsidies, they must ensure their offerings are tightly focused on consumer and

employer demands. The stakes are higher for these schools if the training they provide does not produce measurable employment outcomes. Accordingly, proprietary schools are not able to offer the additional programs and services that allow community colleges to offer consumers a one-stop institution to meet their needs.

As education institutions compete for their share of the training market, their primary competitors are focused alternative providers—rather than companies that house training apparatus, like vendor certifications and corporate universities. The explanation is simple: Companies are in business to make products and produce services, not to train workers. While Motorola University may be an exception, most "corporate universities" are former corporate training departments, not a "university" offering transferable training or training to nonemployees. Similarly, Microsoft is not looking to become the world's leading certifier of tech workers. Microsoft has a technical product that requires expertise to maintain; if businesses are to buy it, they need to be able to hire workers to manage the technology. Microsoft certifications are an extraneous function the company provides to support its central function—building computer systems. To remain competitive, companies do train their workers, but they do not want to be in the training business. Generally, companies offload their training function whenever it makes financial sense to do so.

As education institutions compete for their share of the training market, their primary competitors are focused alternative providers.

Juggling their multiple missions can be burdensome when community colleges try to compete with focused alternative providers. At the same time, if community colleges can harness the synergies from their different education and training functions, they offer students an enormous advantage. The "one-stop shop" approach is increasingly popular. Just look at the success of the Mall of America, Super Wal-Mart, or the ultimate one-stop shop, the Internet. Consumers want convenient, quick, and easy access to everything, including education and training.

For community college training functions to persist in an increasingly competitive marketplace, they will have to be more customer-oriented (Kim and Mauborgne, 1999). Workers looking for credentials or certification generally know what skills they need. If community colleges are to meet those needs, they will have to square off with the for-profit training centers that invest heavily in market

research. This research will help them stay on the cutting edge of employer skill demands. For some schools, this will mean offering only the most profitable certificate programs. Others may choose to subsidize less profitable programs to maintain their comprehensive missions (Bailey, 2000).

Some institutions may opt to shift their training function into a for-profit subsidiary, keeping it at arm's length from the education programs and enabling it to compete directly with other credentialing and certification providers.

Some institutions may want to compete directly with other training providers in credentialing and certification. They may opt to establish their own for-profit subsidiary and separate out the training function, offering those programs at arm's length from the education programs. The advantage of establishing a for-profit training institute is that it can more quickly respond to market demand without the constraints, such as curriculum development procedures and pricing, imposed by state education regulators. Of course, another major incentive for developing a for-profit entity is the ability to raise capital to finance its ventures (Goldstein, 2000). In an era of tight public budgets, raising capital particularly can help these college spin-offs with market research, curriculum development, and resource investments.

Competition isn't the only alternative. A college may decide not to compete with other institutions offering short-term training, and instead focus on its education mission. In areas where schools face a lot of training competition, the community college may best serve the community by focusing on two-year degree programs and articulation to four-year colleges, rather than competing for short-term training students. The danger is losing the synergy that emerges from promoting multiple missions.

The Importance of Collaborations

In addition to working to make changes within themselves, community colleges also should explore partnerships with other education and training institutions. While many community colleges already partner with IT vendors to offer training for their products, there are additional opportunities with other education and training providers as well as with local industry.

In some program areas, instead of competing with for-profit entities, community colleges could partner with them. For example, they could let the proprietary schools offer the more narrow training courses while providing students

with connections to a more well-rounded degree program that gives them credit for their previous coursework.

Community colleges could also partner with each other, sharing faculty and resources to take advantage of the strengths of programs offered at different colleges. Location need not be a barrier in partnering with other programs. With technology, programs can incorporate both classroom-based and on-line or distance learning to take advantage of other providers' courses. Instead of spending a year creating a course that would fit into a particular certificate program, a community college could partner with an institution that already offers that course and work it into its curricula.

In some program areas, instead of competing with for-profit entities, community colleges could partner with them—letting the proprietary schools offer more narrow training courses while connecting students to the community college's more well-rounded degree programs.

The flavor of local industry also has the ability to influence community college partnerships. In areas with prevalent industry clusters, it is sensible for community colleges to develop or enhance collaborations with local industries that can inform community colleges on local education and training needs. While employer-educator partnerships can result in contract training opportunities, they also provide opportunities for targeted changes in broader degree and certificate programs. For example, if the majority of students in a computer science degree or certificate program are employed in a key local or regional industry, students would benefit from a curricula that meets the needs of that local industry cluster.

At the same time, it is sensible for community colleges to partner with other colleges to provide certificate and degree programs for those students who are looking for skills that are tailored less to local industry. These students need different degree or certificate programs with content that is tied to different career tracks and standards. An effective way to share costs and provide this broad scope of offerings is for individual community colleges or a local consortia of community colleges to partner with other institutions that can provide access to a broader curriculum. Partnering with providers whose curriculum is tailored to meet national certifications would provide an additional benchmark for students looking for nationally recognized skills.

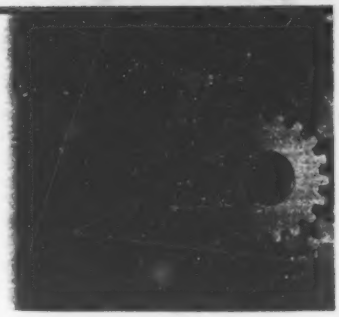
Used wisely, collaborations can provide *economies of scale* to leverage investments and share risks in developing high-quality programs appropriate to the

Used wisely, collaborations between community colleges and for-profit training companies—or between different community colleges—can provide economies of both scale and scope.

local economic base. They can also share costs of new technology that can make learning for certificates or certification less time and place dependent.

Collaborations also can increase *economies of scope* that allow individual community colleges to provide greater variety and customization in program offerings and credentials. This scope must include integrated and aligned education and training opportunities ranging from degreed programs to certificates to standards-based certifications, vendor certifications, and customized training. Moreover, programs must be easy-access, with multiple on-ramps and exits posted by measured standards and credentials qualifying students both for further education and employment. More than ever, community colleges must demonstrate that they have flexible delivery systems that include narrower credentialing as well as broader educational options.

Ultimately, community colleges have a choice in what kind of institution they want to be. But unless they are willing to accommodate the kind of learning that students and employers want, an increasing number of alternative providers will emerge to take up the slack.



PART 7: Desperately Seeking Synergy

Today's community college has expanded to offer both general education and vocational education and training, including certificates, vendor certifications, and customized training for employers. But the role of the community college as a springboard into four-year academic programs cannot be overlooked. The challenge for community colleges is to increase synergy among these different forms of work-related preparation in ways that nurture them all while ultimately fostering academic education. To the extent that they succeed, the path from short-term training to broader vocational and academic education should become better traveled, better marked, and easier to follow. Maintaining the healthy exchange between academic and vocational learning is key to the community colleges' ability to increase access to postsecondary education.

The academic-versus-vocational problem may seem like an "either/or" choice. Should the community college focus on academic transfers or on a range of work-related programs as its core and quality standard? Some observers view the movement toward providing vocational credentials, certifications, and customized training as a process of commercialization. They say it competes with the community colleges' broader social mission to provide access and upward mobility through academic preparation. Viewed from the perspective of the comprehensive community college, however, this seems a false dichotomy. The ability of community colleges to fulfill their broader social mission depends to a large extent on the exchange between academic education and the various forms of vocational education and training—give-and-take that would not exist if either role were compromised.

Those who choose the vocational model over the more comprehensive academic and vocational alternative must understand that this choice reduces opportunities in the nation's communities for academic preparation and transfer. Of course, some students would surely go to four-year colleges if two-year academic preparation was not available, but the economic and social forces that drew them to two-year colleges in the first place would be major barriers for many

The academic-versus-vocational problem may seem like an "either/or" choice—but the ability of community colleges to fulfill their broader social mission depends largely on the exchange between academic education and the various forms of vocational education and training.

more. A shift to a purely vocational program would close off the opportunity to migrate from vocational to academic programs within the community colleges. It would also water down the general educational content in community college vocational degrees, reducing the transferability of vocational students to academic programs. In addition, those who terminate their college careers with vocational degrees or some vocational education short of a degree would be denied access to general academic preparation. Such preparation is crucial to flexibility in labor markets and provides individual development of intrinsic value in a democratic society.

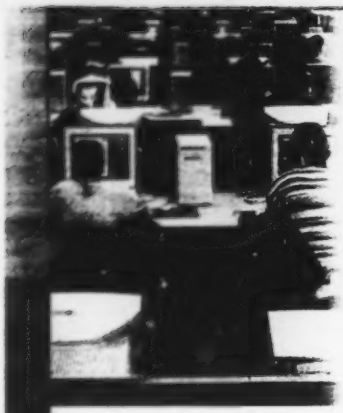
Community colleges must remember their roots: They have evolved as institutions that fulfill their social role by mixing academic and vocational functions.

Divorcing academic from vocational functions in community colleges would have other costs as well. It would eliminate the healthy synergy between the public and private stakeholders in community colleges. This would risk the loss of prestige, revenue, and political support that comes from these broad-based coalitions—coalitions that have helped community colleges blossom into the key education and training institutions they are today.

Without a doubt, the knowledge economy makes postsecondary education more important in the career prospects of individuals and in the nation's overall competitive standing. The growing economic importance of postsecondary education, combined with a projected cost squeeze due to swelling student numbers, will raise fundamental questions about the role of community colleges, forcing choices between their academic and vocational roles. The obvious concern is that the increasing financial pressures on community colleges will reduce their scope as well as the democratization they bring to postsecondary education. Cost pressures in higher education may encourage policymakers and educators to rely on community colleges' entrepreneurial abilities to hold down budgets. However, an increased focus on work-based learning in community colleges may divert qualified students from achieving transfers and baccalaureates.

To face these challenges, community colleges must remember their roots: They have evolved as institutions that fulfill their social role by mixing academic and vocational functions. Investments that promote synergy between these functions will help them develop their cutting-edge role as a training provider, while reducing the diversion of qualified students from attaining bachelor's degrees.

Community colleges should strive to view the challenges before them not as dangers, but as opportunities. As a uniquely American hybrid, community colleges are ideally positioned for further evolution as both academic and vocational credentials multiply and as the line between academic and applied learning blurs.



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